MACHINE TOOL Blue Book

AUGUST 1941

DoAll SAVED $600 ON THIS ONE JOB!

...dor-Wilson Mfg. Co., ...Kees Rocks, Pa., had an ...portant defense contract ...ing for forgings for ...e parts in the fore... ...nd. Dies would have ...lots of money. Making ...m by hand would have ...n slow and very ex... ...sive. The DoAll made ... parts in 16 hours and ...s firm calculates that ... saving was $600

...ODAY'S MIGHTY PRODUCTION TOOL

★ **When Precision Cutting is Essential**
When Speed is a Big Factor

...All is doing First Aid service in large and small plants wherever metal is cut—to make ...ds, dies and special tools—on the production line in motor and aeroplane factories, ...nals, ship yards, etc. Takes the place of shaper, milling and lathe work.

...ne of DoAlls in use at Canadian ...child Aircraft, Limited, Montreal, Que.

IMMEDIATE DELIVERY

Every 40 minutes a DoAll comes off our assembly line. We are keeping up with the demand for these indispensable machine tools. All orders are given prompt attention.

Let one of our trained men come to your plant and show you how the DoAll can cut time and costs for you.

FREE—Literature and 150-page Handbook on Contour Machining.

CONTINENTAL MACHINES, INC
1300 S. Washington Ave., Minneapolis, Minn.

Associated with the DOALL COMPANY, Des Plaines, Ill. Manufacturers of Band Saws and Band Files for DoAll Contour Machines

MARVEL SAWS

Cuts Two 6″ dia. Gear Blanks every 11 minutes

There are 12 MARVEL Saws at the Northern Pump Co., Minneapolis, some of which are in their tenth year of service. The Giant Hydraulic No. 18 MARVEL pictured above, is a comparative newcomer in the Northern MARVEL family, having been installed just 3 months ago, to speed up production on large work. When pictured, it was cutting-off gear blanks from 6″ dia. S. A. E. 3120 hot rolled steel, two at a time, cutting-off two blanks every 11 minutes.

Whether you want thin slices or long lengths cut-off from flat or round bars, MARVEL Saws will produce more pieces per hour and will cut them off at lower cost per piece than any other machine or cutting-off method. Included in the MARVEL System are small inexpensive dry-cutting shop saws; heavy duty all-ball-bearing high speed hack saws (the fastest saws built); automatic production sawing machines that require no more operator attention than an automatic screw machine; a metal-cutting band saw that saves hours of machining, roughing to size and shape; and a Giant Hydraulic Hack Saw, that cuts the toughest steel with ease. MARVEL High-Speed-Edge Hack Saw Blades are positively unbreakable, can be safely operated at maximum speed and feed on any hack sawing machine.

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*

5700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 223 LaFayette St., N. Y.

RIVETT 918

8 OPERATIONS—1 CHUCKING

Balanced design and superior operating features of Rivett 918 hand screw machine make it an efficient producer on small precision parts. Lever operated draw-in or push-out collets hold work. Spindle speeds, 150-3750 r.p.m. controlled by single lever. Automatic brake stops spindle.

WRITE FOR BULLETIN 918 FOR DETAILS.

RIVETT LATHE & GRINDER Inc

BRIGHTON, BOSTON, MASS., U.S.A.

... speed up production .. improve our product and ... cut our costs!"

"First of all, 'Simplified' Arc Welders are bu to deliver high quality welds hour after hou Liberal use of copper and a more efficient ve tilating system guarantees us a cool operati welder ... there's your increased productio

"Then with the choice of 1,000 combinatio of heat our operators can make *exactly* t right adjustment to get highest quality welc This feature helps improve our product.

"As to cutting costs, there's whe 'Simplified' Arc Welding shine This is the welder that gives us R mote Control at no extra cost. Wi this feature our operators save tim by eliminating extra trips to th welder. We'll also cut the numb of rejects. Economical operation Hobart guarantees lower cost.

"Honestly, Hobart 'Simplifie Arc Welders must have 'somethin on the ball'. A list of Hobart use reads like 'Who's Who' in Americ industry and ..."

"That's enough! I'll write tod for detailed information ... the must be a darn good reason wh Hobart is the 'Fastest Selling Wel er on the Market'."

Let Hobart Prove it to YOU

Use a HOBART on your own work to prove it pays for itself. Write for details.

HOBART ELECTRODES

are available in a type and size for every welding requirement.

Write for handbook EW-68 and prices.

Send for your copy OF THIS VALUABLE BOOKLET **FREE**

Hobart Bros. Co., Box TB 81 Troy

Send complete information on items checked: ☐ Electric Drive: ☐ A. C. Welder: ☐ Gasoline Drive: ☐ "Build Your O Generator: ☐ Electrodes: ☐ Send informa on Welding School.

NAME_____

POSITION_____

ADDRESS_____

HOBART

ONE OF THE WORLDS LARGEST BUILDERS OF ARC WELDING EQUIPMENT

Specify HARDINGE COLLETS FOR ACCURACY AND DURABILITY

The name HARDINGE on a collet is an accuracy and durability guarantee. When ordering collets only, or when ordering collets with lathes and milling machines of any make or size, specify HARDINGE Collets—they cost no more than other collets.

The stamping on the face of a HARDINGE Collet indicates that the finishing grinds were made after hardening the collet to assure concentricity.

Accuracy with durability comes from special steel, uniform heat treated threads, hardened surfaces for gripping or bearing, and spring temper for proper operation.

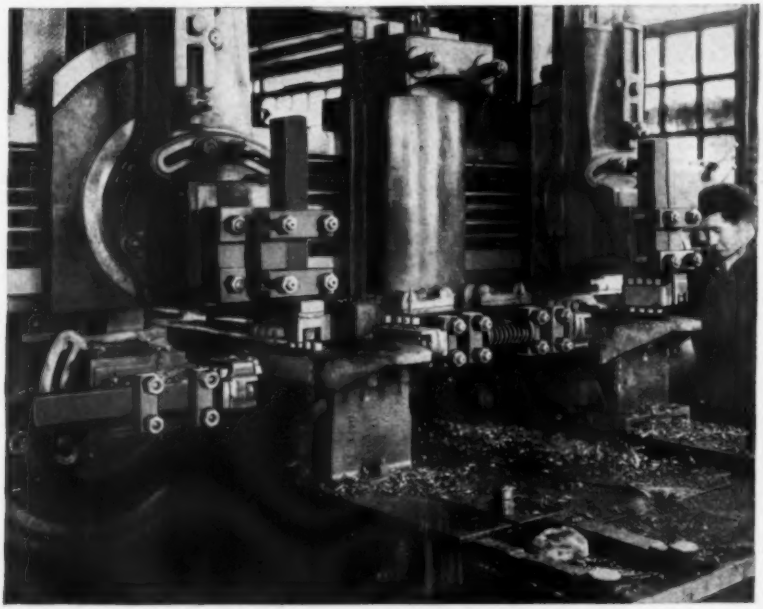
Write for latest HARDINGE Bulletin No. 41

Bulletin No. 41 clearly shows the styles of collets adapted to your lathes and millers. It lists the standard collets with general dimensions for identification, it gives normal round, hexagon, and square capacity of standard collets. It shows how all of your lathes and millers may be adapted for collets. Attractive prices are listed for round, hexagon, and square hole sizes. It gives the location of collet stocks in Elmira, Hartford, New York, Cleveland, Detroit, Chicago, Los Angeles, and San Francisco.

HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

ARMSTRONG



Double your planer output by changing to ARMSTRONG GANG PLANER TOOLS

Even if you can't get delivery on new planers, you can get ARMSTRONG Gang Planer Tools, and especially where large castings or other big areas are to be surfaced, an ARMSTRONG Gang Planer tool will save 50 to 75% of the time required by single point tools. Take the job illustrated above: on this production run, planing 6 parallel surfaces on large steel castings, the 5-headed planer with 6 ARMSTRONG Gang Planer Tools, maintained an output schedule that would have required 12 or more planers, equipped with a single point tool.

Whatever your production problems, if on lathes, planers, slotters or shapers, there are ARMSTRONG TOOL HOLDERS that will step up output on each operation. All have strength to stand up to far greater speeds and feeds than are customarily used. All take cutters, that any mechanic can quickly grind from stock shapes of high-speed steel. All are permanent multi-purpose tools that individually do the work of complete sets of forged tools, that end tooling-up delays and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

WRITE FOR CATALOG C-39

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

308 N. FRANCISCO AVE., CHICAGO, U. S. A.

Eastern Warehouse & Sales: 199 Lafayette St., New York, N. Y.

ARMSTRONG TOOL HOLDERS Are Used in Over 90% of the Machine Shops and Tool Rooms

Machine Tool Blue Book

Hitchcock Publishing Co., 508 So. Dearborn St., Chicago

32,000 This Issue *AUGUST 1941* *Volume 37, No. 8*

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Phone: Harrison 6040 Cable Address: HITCHPUB

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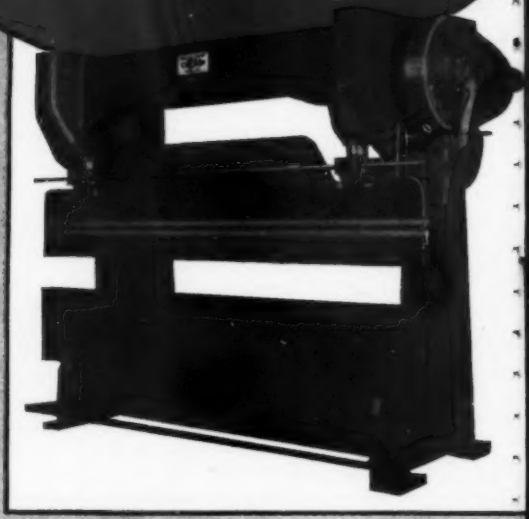
Something to Crow About

NEW "L" SERIES CHICAGO STEEL PRESS BRAKE

BOX AND PAN BRAKE—

POWER BENDING BRAKE—



The Box and Pan Brake forms boxes or pans from one piece of metal. A straight brake as well as a box brake.

The Power Bending Brake is indispensible wherever a volume of heavy plate work is to be done. Forms a great variety of bends and shapes, without dies.

Send your bending problems and write for complete information on all our Press Brakes.

The World's oldest and largest manufacturer of all-steel constructed machinery announce a new low priced modern all steel press brake for the heavy sheet metals and light plate work.

All the main members constructed of rolled steel plate. Equipped with one bull gear inside each end housing. Eccentrics made in one piece with bull gears. Adjusting screws encased in supporting sleeves operate in vertical non-oscillating position. All gearing, eccentrics, ram plungers and ram adjusting worms enclosed in oil.

Ram operates at variable speeds — slow when bending long sheets or fast when forming small pieces. Change of speed is accomplished by turning hand wheel.

DREIS & KRUMP MFG. CO.

7440 LOOMIS BLVD. CHICAGO, ILLINOIS

No. 3 Jones & Lamson Ram Type Universal Turret Lathe with standard bar equipment

Bumps ahead for the little fellow—

APPLYING the "bits and pieces" principle to America's defense program promises to fill many a small plant to capacity — and beyond.

That's Bump No. 1.

If you operate a small plant and face the problem of adding new equipment, the question may come up: "Shall we install special machinery to handle defense work?" When normal conditions return, most special equipment can only be junked and written off your books.

That would be Bump No. 2 — and a rough one.

Then you would face the problem of equipping to meet the driving competition of a post-war world.

That would be Bump No. 3 — and the stiffest jolt of all.

Plan now to smooth out these bumps and keep up your profits. See what versatile, long-lived, high speed, standard Jones & Lamson machine tools can do to help you fill your armament orders promptly and leave you in position to win and hold post-war business later.

It will not obligate you to put your problems up to Jones & Lamson engineers. Inquiries from small plants receive prompt attention here, and we may be able to help you over many of the bumps before you reach them.

PROFIT PRODUCING MACHINE TOOLS

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers.

JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

NIGHT LIFE in a

Grinding Wheel Plant

The new Plant 1 (foreground) replaced the original building at the Norton plant in 1939.

The new Plant 3 (background) replaced the former building in 1938.

New Abrasive Storage buildings built in 1941.

Total additional floor space, 7.6 acres, completed this year.

New tunnel kilns, new manufacturing facilities, larger payroll, day and night operation, have stepped up production.

—and Norton Grinding Wheel deliveries are still normal.

W-828

NORTON COMPANY

MAIN OFFICES AND PLANT AT

WORCESTER, MASS., U.S.A.

WE'LL LET OTHERS TELL YOU . . .

ABOUT SIMMONS NO. 2 TURRET LATHE

We are merely presenting facts when we tell you that the Simmons No. 2 Turret Lathe (1¼" Bar Capacity) offers high precision at low cost . . . that with the Micro-Speed Drive you can select instantly any of 1,000 spindle speeds by the turn of a handwheel located adjacent to the Selector Dial Control on the new cabinet base . . . that the spindle brake is an important asset for short-cycle operations.

We prefer to turn the job of providing superlatives over to some of the many important firms that have found in this sturdy machine the answer to their No. 2 Turret Lathe problems. Firms such as Bell Aircraft Corporation, Bendix Radio Corporation, Cessna Aircraft Company, Fairchild Aircraft, Ltd., Sterling Engine Company, Swift Lubricator Company, Dominion Engineering Corporation, Ltd., and many others. Ask for copies of their comments when you write today for a Descriptive Bulletin.

QUICK DELIVERIES

SIMMONS MACHINE TOOL CORP.

1725 NORTH BROADWAY, ALBANY, NEW YORK

NEW YORK CITY OFFICE 1 BROADWAY

57 Standard Types

CAPACITIES
600 to 50,000 lbs.

THE arbor press you need for efficient production on assembling, straightening, forming, and other operations requiring the application of pressure can be easily obtained from the complete Hannifin line. These pneumatic arbor presses have cast steel frames for strength, and the Hannifin high efficiency air cylinders for uniformly economical use of air power. Cylinders are bored and then honed, producing a straight, round, perfectly smooth cylinder interior. Perfect piston fit is easily maintained with the simple outside adjustment of piston packing. These Hannifin features allow continuous efficient production, without leakage or waste of air power, and with minimum friction loss.

Hannifin arbor presses are built in 57 standard types, capacities 600 to 50,000 lbs., and may be equipped with the Hannifin patented oil cylinder speed control.

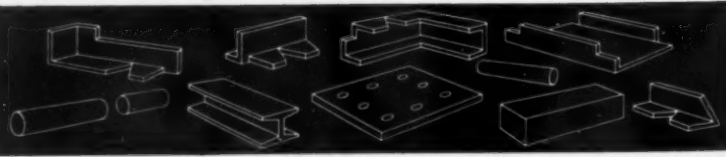
Write for Bulletin 46-H giving complete data on all types

HANNIFIN
MANUFACTURING COMPANY
621-631 South Kolmar Avenue • Chicago

Model B-2 Arbor Press, built in capacities from 1700 lbs. to 18,000 lbs. Many other types available, both bench and floor models. Alemite lubrication is standard on all types.

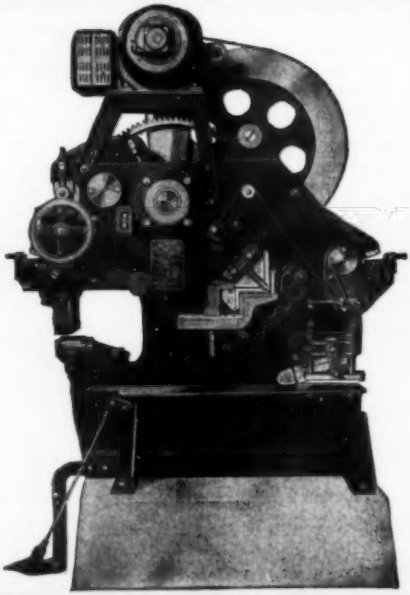
HANNIFIN
PNEUMATIC ARBOR PRESSES

Want Swift Production



on This Kind of Work?

● Who doesn't, these days? And that's why Buffalo Universal Iron Workers are the dependable allies of operating men who are getting time-taking fabricating jobs done *on time*. It costs less, too! Use these versatile machines on angles, tees, rounds, squares, and flat steel—for punching, plate slitting, coping, and notching. Easy to operate—production is as accurate as it is fast. Sizes to fit *your job*.



Write for Bulletin 331-A

BUFFALO FORGE COMPANY

161 Mortimer St., Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **UNIVERSAL IRON WORKERS**

TO FULFILL A DEFINITE NEED in YOUR PLANT

BELTED *Avey* FEATURES
HIGH SPEED
PRECISION BUILT
ONE TO EIGHT SPINDLES
OPTIONAL SPEED RANGES
INDIVIDUAL MOTOR DRIVES
AVEY-MATIC FEEDS
EXTRA LONG RACK TRAVEL
CUTTING LUBRICATING SYSTEMS

Have you checked your drill press equipment lately? Why not do so in the light of AVEY'S modern high speed production features . . . its complete line of machines to meet every production situation . . . its outstanding acceptance among the country's foremost manufacturers. Fast, precision workers in any material, AVEY Drilling and Tapping Machines assure maximum returns on your drill press investment. Write us for interesting facts on the vital subject of drilling and tapping at less cost.

THE AVEY DRILLING MACHINE CO.
Cincinnati, Ohio

LOW COST

LOW MAINTENANCE EXPENSE

INCREASED EFFICIENCY

GREATER FLEXIBILITY

HIGHER EMPLOYEE MORALE

SAVE UP TO 14,400

operator motion feet PER DAY

with this

TORQ-QUA-MATIC TRANSMISSION

A hand screw machine operator starts and stops his machine about 30 times per minute. That's 1800 motions per hour, or 14,400 motions per day. With a TORQ-QUA-MATIC TRANSMISSION the operator will reach only 12 inches to the control lever as against approximately two feet for the overhead drive lever. This is a 50% saving in reaching distance or a saving of 14,400 operator motion feet per day. Such a saving can effect an increased output per day without increased operator fatigue.

Twelve inches is shorter than two-feet—50% shorter. Apply that simple fact to your own plant operations and you will see where TORQ-QUA-MATIC TRANSMISSIONS will mean INCREASED EFFICIENCY for you.

These individual motorized unit drives can be installed—ready to run—in as little as two hours.

Write for specific prices and sizes for your plant TODAY.

TORQ-QUA-MATIC TRANSMISSIONS are powered by sturdy TORQ MOTORS. They are built to NEMA specifications, are completely ball-bearing, highly efficient and are built to take punishment. Sizes ¾ to 15 H. P. Deliveries can be made from stock.

Next Month: How TORQ-QUA-MATIC can increase machine flexibility.

THE TORQ ELECTRIC MFG. COMPANY

6605 CARNEGIE AVENUE • CLEVELAND, OHIO

For the *Dust-Bowl* Jobs—

AIR or HIGH-CYCLE?

Foundries, for example. Dusty air is drawn through the tool. Dirt sometimes gets into exhaust ports, bearings and motor. Tools are often dropped in the sand. What would I recommend—Air or High-Cycle?

For the average foundry—Air. Because: (1) Air tools are about 2 to 6 lbs. lighter than corresponding High-Cycle tools—easier to handle—get more work out under average foundry conditions. Air is usually available anyhow. (2) Maintenance of air tools is simpler and easier for the average foundry repair shop.

When High-Cycle? (1) For lower first cost. (2) For lower power cost. (3) When proper care can be taken of the tools. (4) When you want to eliminate the dust-blowing caused by Air tools. (5) When you want quiet operation.

I'm unbiased. Perhaps modern Air tools should be used in *your* foundry or shop—or perhaps High-Cycle tools. It depends on your own problems. I can recommend either type to assure you tops in performance and satisfaction. Call me in. No obligation, of course.

THE ROTOR ANALYST

Lower maintenance and lighter weight usually favors the selection of Air tools for "dust-bowls" such as the foundry. Complete details on Rotor Air Tools in Cat. 24 (gratis).

The Rotor Analyst has 65 different Air tools and 59 different High-Cycle tools with which to solve your problems.

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Play Safe!

FULFLO WON'T LET YOU DOWN

FULFLO

FULFLO experience and FULFLO standards are the foundation on which FULFLO Products are built....the result, the ultimate in dependability.

Horizontal or vertical types

Ask for details.

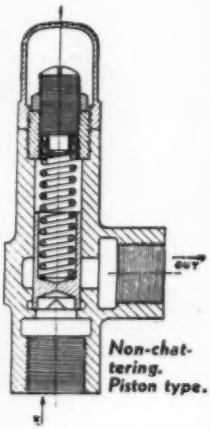
CENTRIFUGAL COOLANT PUMPS

Always right on the job .. always reliable for efficient service. Flexible in installation insuring exact position of discharge

• • •

BY-PASS OIL RELIEF VALVES

For oil hydraulic pumping units where specific pressure must be maintained. Cast iron or brass. Brass, hardened or stainless steel pistons.



Non-chattering. Piston type.

THE FULFLO Specialties Co., Inc.

BLANCHESTER, OHIO

Precision PERFORMANCE

with SPEED TO SPARE!

Radiator valve body shells being tapped on a Haskins No. 2-CAM Air Controlled Tapper equipped with a micro-switch controlled, air-operated vise.

Tapping to Class 3 and 4 Fit — Even to Micrometer Accuracy — the Haskins Type C Tapper is as much as Doubling Production on Many Jobs!

DID YOU ever see a Haskins Type G Tapper put through its paces? It's as pretty a picture of speed and precision as you're likely to find!

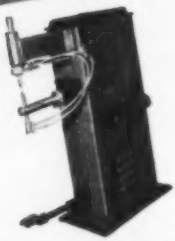
Quick, easy adjustments set the machine for the job at hand. Then all the operator does is depress the foot pedal and load and unload the work. Everything else is *automatic*. *Air* controls the down and return strokes, the dwell at top of stroke. *Air* makes the tapping pressure so *uniform*—so *sensitive*—that if the tap dulls or loads, tapping action stops. The tap cannot be forced.

We don't have to tell *you* what this means in terms of faster and more consistent production, longer tap life, fewer operator errors and less operator fatigue. We believe that if you are interested in these things, you'll tell us to give you *all* the facts!

A FREE BOOKLET — "Precision Tapping at High Speed"—explains and illustrates the three capacities in which the Haskins Type C Tapper is available. Write for your copy. R. G. Haskins Company, 623 S. California Ave. Chicago

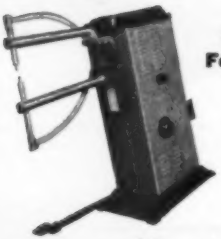
REX

Heavy Duty SPOT WELDERS

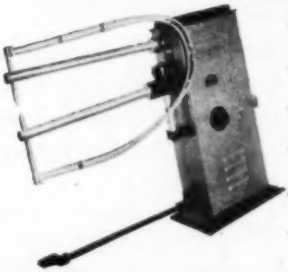


Press Type
Foot Operated

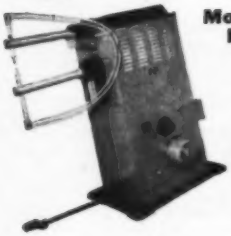
Rocker Arm
Air Operated



Rocker Arm
Foot Operated



Foot Operated
Swivel Lower Arm



Motor Operated
Rocker Arm

PROMPT DELIVERY

Self contained Steel Cabinet units . . . Specially built and insulated heavy duty transformers . . . Stationary or adjustable or swivel lower horn . . . Swivel action foot pedal . . . Wiping action pass through switch . . . Silver to silver contacts, variable heavy duty heat control switch . . . Foot, motor or air operated, press or rocker arm types from 2½ to 100 K. V. A. . . . Bench models from 2½ to 7½ K. V. A.

Dyer WELDER AND ENGINEERING Company

7 East 19th Street, Kansas City, Mo.

New Tapping Machine Gives You Better Tapping

This new Procunier Universal Tapping Machine with the latest Tru-Grip Tap Holder, embodies revolutionary features that increase tapping output—and greatly increase tap life. These features include: 1. Four speeds, ranging from 390 to 2050 R. P. M. efficiently handle jobs for which conventional high speed tapping machines are inadequate. 2. One machine handles tap sizes from No. 2 to ½" through two interchangeable heads. 3. Extra long Spiral Compensating Springs, conveniently located, with wide range handscrew adjustments, maintain pre-set tap feeding and reversing pressures INDEPENDENT OF OPERATOR.

Tap Establishes Its Own Lead

The New Procunier Universal Tapping Machine is so designed that it actually allows the tap to establish its own lead. There is nothing more accurate than the tap itself in thread-cutting—so maximum tapping efficiency is attained where the tap is free to establish its own lead in cutting the thread.

This means more accurate tapping with every thread uniform, greater production with less spoiled work and less tap breakage. Send coupon for illustrated bulletins giving full details and prices, on Procunier Universal Tapping Machines, High Speed Tapping Head, and Tru-Grip Tap Holder.

PROCUNIER

SAFETY CHUCK COMPANY
14 S. Clinton St., CHICAGO, ILL.

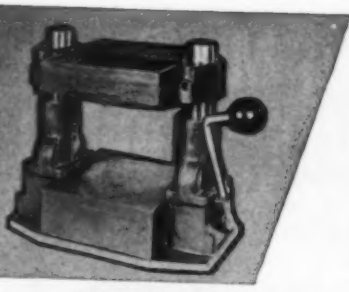
PROCUNIER SAFETY CHUCK CO.,
14 S. Clinton St., Chicago, Illinois

Send me Bulletins on: ☐ Universal Tapping Machines. ☐ High Speed Tapping Heads. ☐ Tru-Grip Tap Holder.

Name .....

Address .....

City ..... State .....



IMMEDIATE DELIVERY

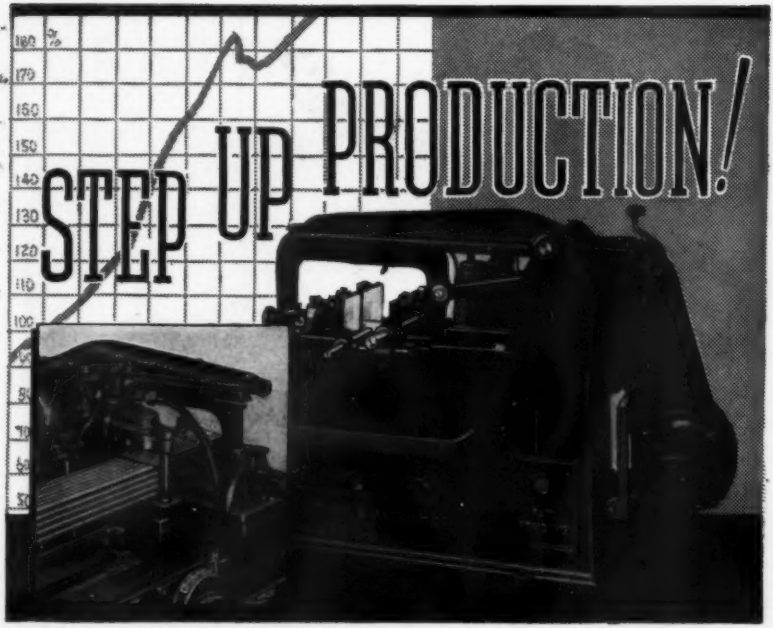
FOR USE ON

DEFENSE PRODUCTION

Mijit and Esco Jigs are standardized items kept in stock for quick shipment. More than 50 styles and sizes are available. Generally, one can be chosen which, with a simple adapter block will fit your purpose. They save long hours of jig and fixture design—many costly hours of toolroom work—and speed up machining operations enormously. At the upper left is shown the Esco Jig, one of the many styles available. Upper right is featured the Mijit Jig, and lower center shows the Jack Lock, a unit providing a simple adaptable locking device for large fixtures and applicable to milling machines and planer operations. All these, plus our many others, are available for immediate delivery. Why wait longer? Order yours today, or write for free information and details.

ESCO ENGINEERING CORPORATION

4855 FOURTH AVE., DETROIT, MICH.



These RACINE . . . . .
OIL-CUT MACHINES

will cut cold rolled bars at the rate of 5 to 6 square inches per minute. 3 inch steel tube with ¼" wall is cut in 30 seconds. 3-inch round cold rolled SAE 1020 is cut in 1 minute 30 seconds. 6-inch round in 5 to 6 minutes.

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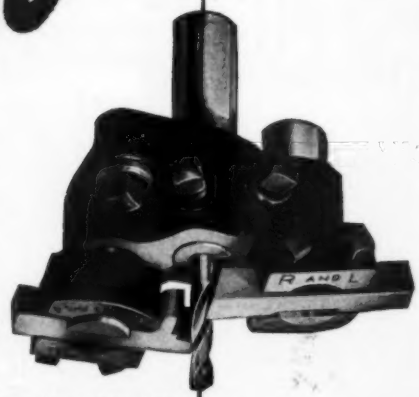

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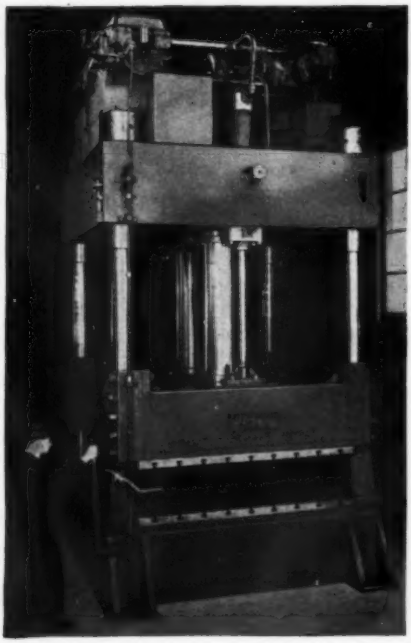

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Stroke	49'	Distance between columns, f. to b.	84'
Maximum opening, stroke up	60'	Platen size, r. to l.	108'
		Platen size, f. to b.	84'

Motor required for operating knock-out cylinder, 2 h. p., 1160 r. p. m. Either of two pumping units may be supplied for operating press. One of these uses a 30 h. p., 860 r. p. m. motor. The other uses a 60 h. p. motor and permits higher pressing speeds.

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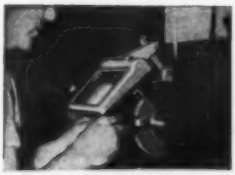

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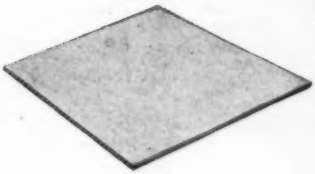

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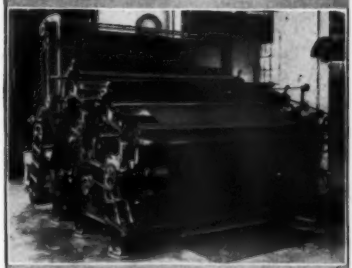

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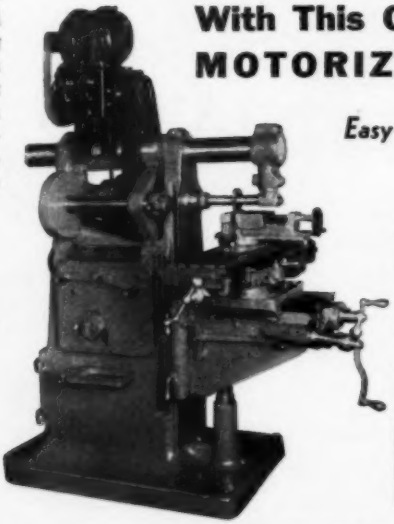

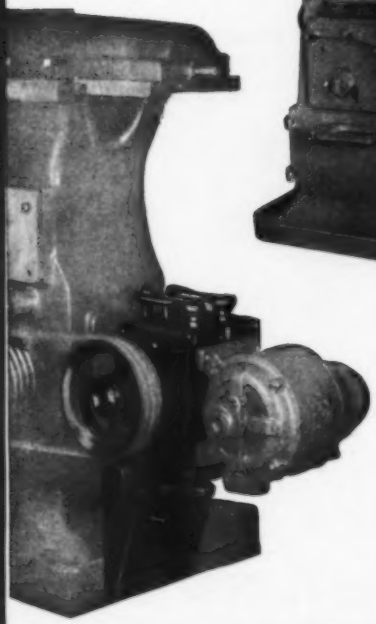

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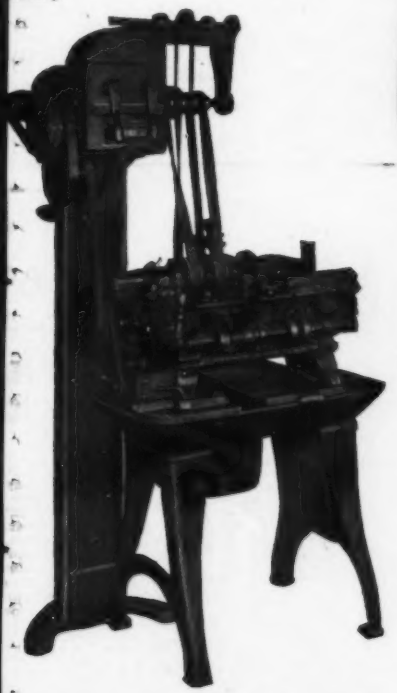

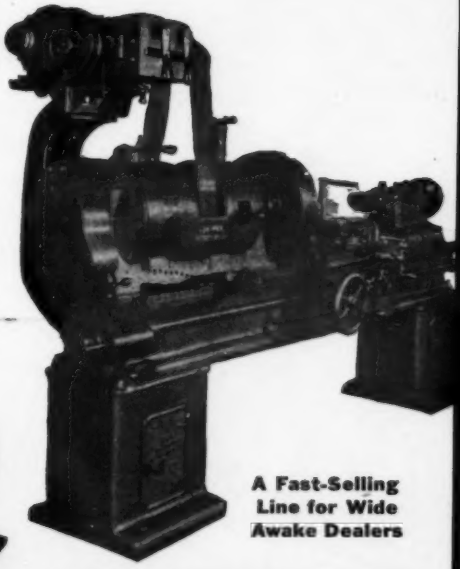

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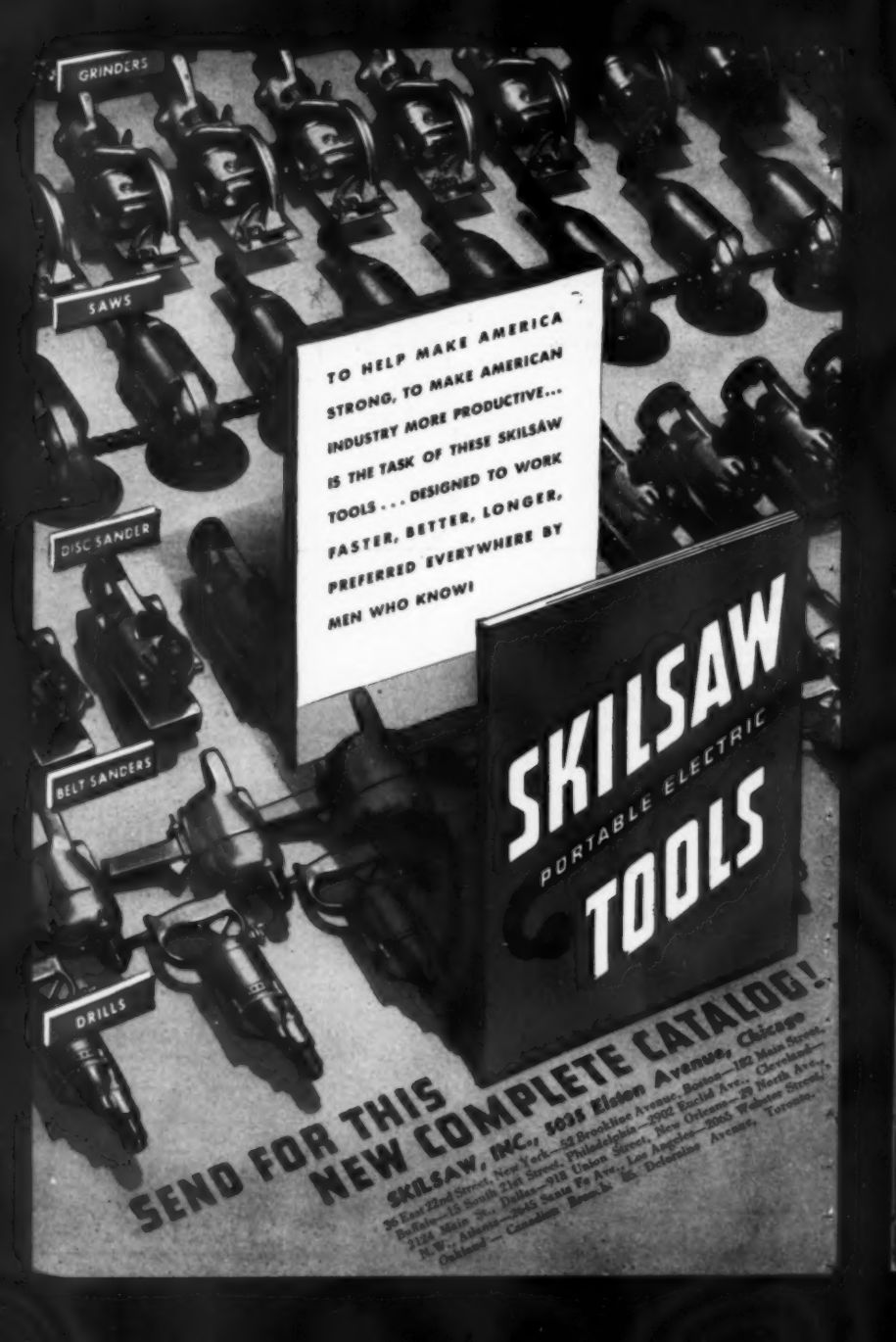
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Featured In This Issue

MAXIMUM SHELL PRODUCTION—Speed, Feed, Depth, Horsepower, Tool and Tool Life are coordinated by Dr. M. Kronenberg into a simple system which makes the data readily usable in shops participating in the current defense program. Originally presented at the Third National Defense Meeting of the American Society of Mechanical Engineers in Cleveland, this material is reproduced through courtesy of The Cincinnati Milling Machine Co., starting on page 33

RESISTING ABRASION, CORROSION AND HEAT—Cobalt-chromium-tungsten have long been used for cutting tools and welding applications. These alloys are now being used extensively in the form of castings and forgings in applications where severe abrasion is encountered, often accompanied by corrosion or heat, or both. R. L. Lerch of Haynes Stellite Co., Kokomo, Ind., reviews some of these new uses in a story commencing on page 55.

THREADING LIGHT METALS—Many new light alloys of aluminum, magnesium, etc., are being used in plane construction. Physical characteristics of these new alloys require deviations from normal threading procedures. H. A. Paine of Geometric Tool Company's Engineering Dept., at New Haven, Conn., covers the essential points in a timely contribution on page 75

HEAVY DUTY PORTABLE TOOLS—Some of the manifold uses of the larger portable tools are reviewed by Carleton Cleveland. Many of the hints given should help in speeding production and cutting costs. See page.....87

EQUIPPING A PLANT WELDERY—A great many plants are providing, or considering Welding Departments. Francis A. Westbrook contributes some helpful suggestions as to the equipment needed and presents a few examples of types of jobs handled, on page 121

SPEEDING PLANE ASSEMBLY WITH EXPLOSIVE RIVETS—Riveting has been something of a bottleneck in metal plane construction. D. L. Lewis of E. I. du Pont de Nemours & Co., Wilmington, Del., tells of his Company's recent development of explosive rivets as an answer to the problem of blind riveting on page.....135

WHAT'S NEW IN THE INDUSTRY—Presents the latest developments in the machine tool field—many efficient and speedy new tools for stepping-up production, in the section commencing on page 143

PUNCH CLEARANCES—There has been little specific information and much guess-work in connection with punch clearances. J. A. Smith, President of Durable Punch & Die Co., Chicago, collected available engineering opinions on the subject and supplemented these with research of his own. The result is a chart which has been especially helpful in laying out piercing jobs. See page 157

POSITIONERS FOR WELDING—It would be troublesome and costly to handle many of the larger welding jobs without positioners. The requirements and uses of these handy welding adjuncts are explained by Robert E Stewart on page 161

HARD TO MACHINE? Comparatively simple equipment for testing the machinability of various metals and alloys is described in detail by Herbert A. Reece of the Meehanite Research Institute of America Inc., Pittsburgh, through whose courtesy the story is reproduced, on page 165

AUTOMOTIVE BROACHING OPERATIONS—Crankcases for the Ford "Sixes" are being broached with a new Colonial Broach set-up described on page 171

"LET'S TALK SHOP"—Up-to-the-minute tips on Lubrication, Carbide Tools, Maintenance Welding, etc.....177

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Editor's Page

THIS war has revealed many startling departures from the patterns of other major conflicts. Time and again, campaigns and alliances have shifted at a pace that has kept forecasters on the jump.

We have seen the rise of air power as prophesied by our own Billy Mitchell . . . the motorized might of swift, mobile fighters . . . and waning faith in tremendous fortifications and battleships. Solemn pacts have gone out the window when Nazis found it expedient.

The record emphasizes need of the utmost haste in supplying more guns and planes to Britain . . . of speeding impregnable defenses for the Americas . . . providing weapons and an air fleet so powerful that no country, or group of countries will dare challenge our shores. The democracies slept while Hitler was stocking arsenals to the rafters. Now we must excel Nazi preparations in a much shorter interval of time . . . and we will!

Good progress has been made in tooling-up. As we approach total utilization of our defense resources, we shall have to forego many of our luxury and comfort goods. It will probably mean giving up more than the British or German civilians, because our heavy industries are larger and more extensive. European living standards are lower and it was easier for them to start new and additional heavy industries than for us to make the major shift from peace to war-time requirements.

It will mean self denial in many ways . . . but we are a fortunate people . . . we can have planes, guns, tanks—and butter. Our homes and cities are intact and we're taking steps to keep them so.

Wesley G. Paulson

Vacation this Year ?

Though our national emergency is shortening and even cancelling many vacations this year, we hope you'll be able to slip away for a few days at least. While you're gone, your department can rely on Ryerson for the best steel-service that present-day circumstances will permit. In times like these, we are naturally out of many sizes but we still have a fair stock and service continues without interruption.

So make the most of your days off . . . Relax ! Build yourself up for the hard winter months ahead. Ryerson will help hold the fort.

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Maximum Shell Production

By M. KRONENBERG

THE topic of this discussion brings back to my memory the times of nearly 24 years ago. I was recalled from the trenches while serving with the field artillery to report at a newly built armory, where howitzers and cannon were being manufactured on a mass-production basis.

To be put in charge of a time-study department was embarrassing to me since I was not even graduated from the university at that time. In this situation, F. W. Taylor's book, "On the Art of Cutting Metals," was my rescue; through it I came first into contact with the problems which have remained the main field of my interest and research and which likewise are the subject of this article.

It was Taylor who first realized the importance of a scientific approach to the problems of the shop. He wanted to eliminate the customary "rule of thumb" governing one of the most important branches of production, namely, the utilization and setting of machine tools.

Taylor was well aware of the difficulties involved. He wrote:—"By far the most difficult and elusive portion of this work has been the mathematical side:—First, finding simple formulas which expressed with approximate accuracy the effect of each of the numerous variables upon the cutting speed; and second, finding a rapid method of using these formulas in the solution of the daily machine shop practice ... The best mathematicians smiled . . . and returned the problem . . . with the statement that it belongs distinctly in the realm of rule of thumb and could be solved only by the slow method of trial and error."

The mathematicians consulted by Taylor presented formulas considerably too difficult for practical application. On the other hand, the values in engineering handbooks and catalogs are often given with wide limits, not permitting accurate calculations. Therefore, the "rule of thumb" for setting machine tools is still predominant in the shop.

The "slow method of trial and error" as Taylor called it, must, however, be eliminated, especially today, in order to promote the production of implements of war. It is of utmost importance to furnish all shops engaged in defense work with a method enabling them to utilize quickly the results of research in metal cutting accomplished since Taylor's time.

So far, however, the data collected are not available for ready use.

Thus, it occured to me that, if a simple system could be developed to make these data readily available for use in the shops of this country, a great contribution would be made to the current defense program.

Such a system has been developed for the particular problem of machining shell material; it is naturally also possible to adopt this system for different materials and tool contours.

This article presents a method for the coordination of speed, feed, depth, horsepower, tool, and tool life for maximum shell production, combining simplicity of practical application with correctness of the mathematical relationships involved. The "shell machining chart" which is here discussed is based on the best data available. They have been theoretically checked with results of investigations in this country and abroad.

The A. S. M. E. Committee on Metal Cutting Data prepared a "Manual on Cutting of Metals," which was published in 1939. In my opinion, the data collected in this book represent the best raw material to help solve our problems. They can, however, not be used directly owing to the complexity of correction factors to be taken into consideration.

In order to determine, for example, the cutting speed and horsepower needed for machining SAE X-1335, it is necessary to multiply values tabulated for SAE 1020 hot-rolled by so-called machinability constants.

Further factors must be taken into consideration for figuring the speed and horsepower in case of using a cutting fluid, dependent on the size of the chip. Moreover, multipliers must be used for change from high-speed steel to sintered-carbide tools, and also for changes in the desired tool life.

If one value, say the feed, is changed, it is necessary to go through the procedure again, and it is therefore difficult to see the effect of a change on the other variables. Owing to the fact that speed, horsepower, tool life, and the like do not vary proportionally, it is not easy for the men in the shop to interpolate the figures given in the Manual.

This is in no sense a disparagement of the A. S. M. E. "Manual on Cutting of Metals," as in my opinion, the abundant data compiled in this book are extremely useful, especially to all of us familiar with metal-cutting research. The Manual provides specific values for many materials, including SAE X-1335, which are not available elsewhere.

In regard to the cutting-fluid multipliers given in the Manual, only one source is quoted from which the values given have apparently been derived, namely, tests carried out by Schlesinger in 1928 at the Engineering College of the University of Berlin. It happened to be my privilege to be connected with this investigation, as may be seen from two publications on this subject.* It can, therefore, be stated that a single cutting-fluid factor could be used instead of the varying factors listed in the Manual.

The Shell Machining Chart

Complex formulas are not useful for the shop and seldom even for engineers if quick information is required. Tabulations, on the other hand, are usually not instructive enough since it is not possible to show the coordination of a multitude of variables. Therefore, charts are the best means to transmit results of research to the men who are supposed to use them.

The shell machining chart presented here, Fig. 1, is intended to solve the problem of the most effective combination of cutting speed, feed, depth, horsepower, tool, and tool life for the particular case of turning shells made of SAE X-1335.

It has been prepared for a common roughing tool corresponding in shape to tool No. 4, and for the use of a cutting fluid supplied at a rate of 5 gpm as recommended in the Manual. In the case of using sintered carbide tools it may sometimes be necessary to reduce the

*Zeit V. D. I., 1928, p. 1198, and Maschinenbau, 1928, p. 628.

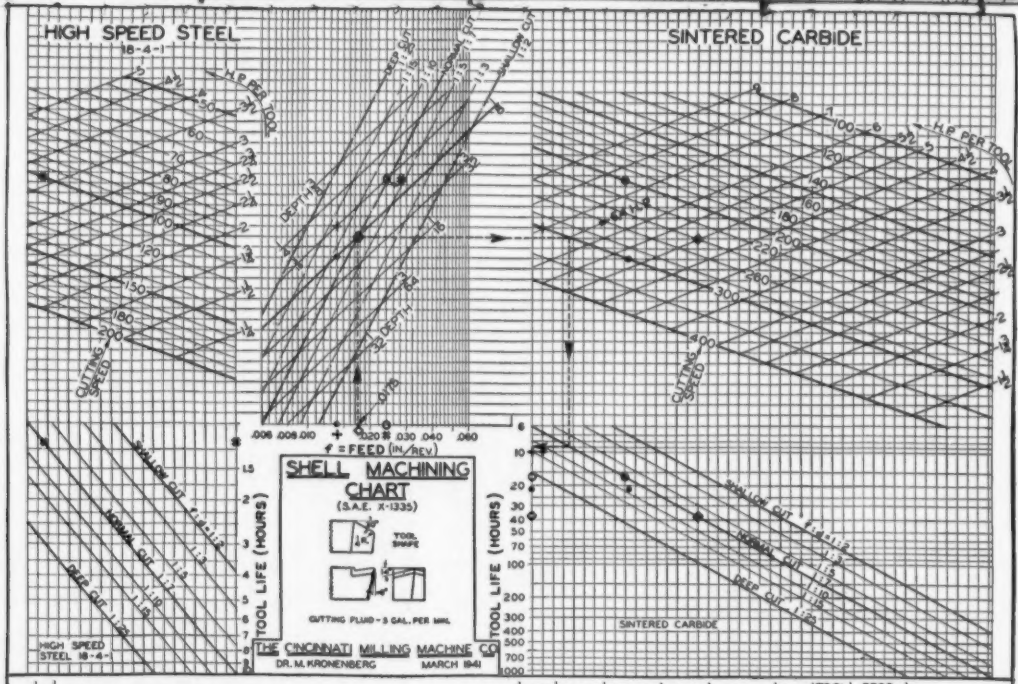


FIG. 1—SHELL-MACHINING CHART: EXAMPLES FOR ASSUMED FEED RATES

EXAMPLE NO.			FEED	DEPTH	RATIO	SPEED	TOOL	H.P.	TOOL LIFE	PROD. FACTOR
1	--	INITIAL EXAMPLE	.0175	1/8	1:7	300	SINT. CARB.	6.4	9	100%
2	•	DECREASE FEED	.014	1/8	1:7-1:10	300	SINT. CARB.	5.25	21	80%
3	◇	DECREASE SPEED	.0175	1/8	1:7	240	SINT. CARB.	5.	38	80%
4	+	DECREASE FEED, INCREASE DEPTH	.014	3/16	1:10-1:15	300	SINT. CARB.	7.	10	100%
5	○	INCREASE FEED, DECREASE SPEED, INCREASE DEPTH	.024	3/16	1:7	200	SINT. CARB.	7.5	16	114%
6	#	INCREASE FEED, DECREASE SPEED, INCREASE DEPTH, TOOL CHANGE	.024	3/16	1:7	100	H.S.S.	3.7	42	57%

EXAMPLES USING AN ASSUMED FEED RATE

true rake angle of the tool to about 6 to 8 deg. Then the horsepower consumption would rise approximately 4 per cent.

In the center of the chart, inclined lines are seen representing the depth of cut, ranging from 1/32 to ⅜"; they are plotted against a horizontal scale for feed rates of 0.006 to 0.060" per revolution. A second series of inclined lines with a greater slope than the depth lines indicates the shape ratios (feed to depth) ranging from 1:2 to 1:25.

A chip having a depth twice the feed rate is called a shallow cut, while a chip where the depth is 25 times the feed rate is called a deep cut. Between these limits, which are already extremes in practice, lies the normal cut with a ratio of 1:7. Most commonly used in practice are chip ratios in the range between 1:5 and 1:10. The other ratios (1:3, 1:15, 1:25) are included to facilitate the use of the chart for intermediate cases.

The left-and right-hand portions of the chart refer to cutting speed, horsepower, and tool life for high-speed-steel tools and sintered carbides, respectively.

Cutting-speed lines and horsepower lines in these fields intersect each other. The "ratio lines" for the chip shape are repeated as transfer lines in the lower left- and lower right-hand sections leading to the tool-life scales.

The chart may be used in different ways, either by beginning with an assumed feed rate, or with an assumed horsepower, or with any other variable.

Use of the Chart in Case of an Assumed Feed Rate

1 Initial Example.

The coordination of the variables shown on the chart (see Fig. 1) is indicated by a dotted line showing a particular example using an assumed feed rate. Following this line vertically from a feed rate of 0.0175 leads to the line for ⅛" depth of cut, and to the ratio line 1:7 (normal cut). From this point of intersection we proceed in this example horizontally to the field for "sintered carbide" until meeting the line of a selected cutting speed of 300 fpm. Reading parallel to the horsepower lines indicates that 6.4 hp is needed at the cutting edge for such a cut. Reading downward by way of the ratio line 1:7 reveals that the tool life for this example would be nine hours.

To demonstrate the effect of varying the initial variables on the coordinated values, five more examples will now be discussed.

Examples with Change of a Single Variable

2 Decreased Feed Rate.

We want to determine now the effect on horsepower and tool life of a decrease of the feed rate to 0.014" keeping the speed and depth as before. Example 2 is represented on the chart (see Fig. 1) by dots. Following the same procedure, we see that the shape ratio is now between 1:7 and 1:10 since the depth is kept at ⅛". The dot on the 300-ft. speed line indicates a decrease of the required power to 5¼ hp. Reading downward by way of the dot between the ratio lines 1:7 and 1:10 we find an increase in tool life to 21 hours.

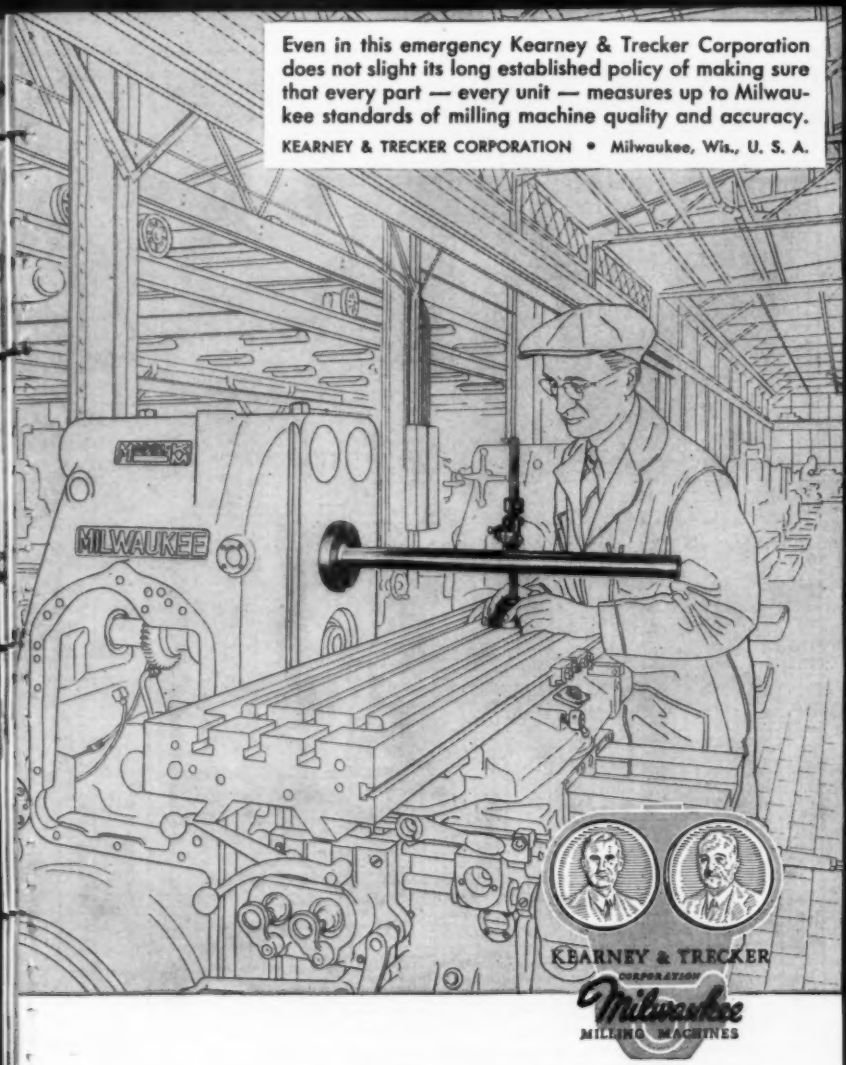
If the production in the case of the initial example is called 100 per cent, then the production will only be 80 per cent in the case of example 2, owing to the fact that the feed rate has been reduced. We need, however, less horsepower and gain appreciably in tool life.

3 Decreased Cutting Speed.

The next problem deals with exploring the effect of decreasing the cutting speed to 240 fpm while the feed rate and depth shall be the same as initially.

Example 3 is marked on the chart (see Fig. 1) by a diamond symbol.

Starting again at 0.0175 feed and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H.P. PER TOOL	EXAMPLE	TOOL	SPEED	FEED	RATIO	TOOL LIFE	RPM	MACH. TIME
3	A ----	H.S.S.	100	.027	1:5	1.6	117	1.12
5	B ●	H.S.S.	80	.049	1:2-1:3	4.4	70	1.03
3	C +	SINCARB	300	.007	1:525	200	350	1.45
5	D ○	SINCARB	180	.013	1:10	350	210	1.30

TOOL PER H.P.	EXAMPLE	TOOL	SPEED	FEED	RATIO	TOOL LIFE	RPM	MACH. TIME
3	E	H.S.S.	100	X	X	LESS THAN 1 HOUR	—	—
5	F ✱	H.S.S.	60	X	X	1:10	—	—
3	G ◐	SINCARB	300	.013	1:10	26	350	.78
5	H □	SINCARB	180	.024	1:5	65	210	.70

FIG. 2—SHELL-MACHINING CHART:—EXAMPLES FOR SETTING A MACHINE OF 3 AND 5 H.P. PER TOOL, RESPECTIVELY, TO PERFORM THE TURNING OPERATION ON THE OUTSIDE DIAMETER OF A 75-MM SHELL

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going up to ⅛" depth we have the initial shape ratio 1:7. Proceeding horizontally to 240 fpm reveals a consumption of only 5 hp and an increase of the tool life to 38 hours. The production factor is 80 per cent in this case, too.

Examples with Simultaneous Changes of More Than One Variable

4 Decreased Feed, Increased Depth

Example 4 is marked by cross symbols (see Fig. 1). The feed rate is reduced to 0.014 and the depth of cut increased to 3/16". The cut ratio is now between 1:10 and 1:15. Proceeding on the horizontal line to 300 ft. cutting speed, we find that the power required increases to 7 hp while the tool life would be 10 hours.

5 Increased Feed, Increased Depth, Decreased Speed.

Example 5 embraces three changes, namely, an increased feed, an increased depth, and a decreased speed (200 ft). Example 5 is shown on the chart (see Fig. 1) by means of small circles. In this case the horsepower consumption rises to 7.5 h.p. while the tool life increases to 16 hrs. In comparison with example 4, the production factor is 114 per cent. Thus an increase in the feed rate, combined with a decrease in speed, results in an increase in production.

6 Increased Feed, Increased Depth, Decreased Speed, Tool Change.

Example 6 covers the case of changing four variables. In addition to the changes of example 5, we change the type of the tool by selecting new high-speed steel. The example is marked by double-cross symbols (see Fig. 1). This time we have to proceed horizontally to the left from the feed-depth intersection. Thus, we obtain a horsepower consumption of 3.7 hp and a tool life of 1.2 hours. The comparative production factor would be 57 per cent, since the cutting speed is decreased so much that it does not compensate the increase in feed in comparison with example 4.

Use of Chart in Case of an Assumed Horsepower

The specific use of chart with reference to shell production will now be dicussed.

We are assuming that two different machine tools are available and that the setting of these machines for maximum shell production is to be determined. The first four examples refer to the case of a machine of 9 h.p. (net), the second four examples to a 15-hp machine.

Assume the following problem:—We want to explore the various cutting possibilities for performing the turning operation of the outside diameter of a 75-mm shell with three tools and a depth of cut of ⅛", as shown in the sketch in the lower right-hand corner taken from an article by Charles Grazi-ozo in American Machinist of Sept. 4, 1940.

Examples of 3 H.P. per Tool

With three tools acting simultaneously on a 9-hp machine, the power available per tool is 3 hp. The longest distance traveled is 3.55". The forged diameter of 3.30" is to be turned down to 3.05". (The revolutions per minute of the spindle are therefore obtained by multiplying the surface speed by 1.165.) Procedure:—Tracing along the 3-h.p. lines in either the high-speed-steel field or in the sintered-carbide field gives intersection points with various cutting-speed lines.

Example A is indicated on the chart (see Fig. 2) by a dotted line, for a cutting speed of 100 fpm and high-speed steel. From the point of intersection (100 ft. with 3 h.p.), we proceed horizontally to the line of ⅛" depth of cut, realizing immediately that the coordinated shape ratio is close to 1:5. Reading downward, a feed rate of 0.027 is found, which is the proper value for setting the feed on the machine in order

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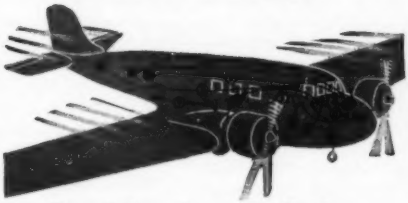

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to exploit 3 h.p. per tool at 100 ft. cutting speed. The correlated tool life is read vertically below the intersection of the 3 h. p. and 100 speed line by way of the shape ratio 1:5. The tool life is 1.6 hours. One hundred and seventeen spindle revolutions are needed. Thus, we obtain a machining time of

$$\frac{3.55}{0.027 \times 117} = 1.12 \text{ min. per shell.}$$

In **Example B** the effect of reducing the cutting speed to 60 fpm is considered and indicated by dots (see Fig. 2). The shape ratio is between 1:12 and 1:3, and a feed of 0.049" per revolution is necessary to utilize the available 3 h. p. per tool. Tool life increases to 4.4 hours and the production time is reduced to 1.03 min per shell.

It will again be noticed that a lower speed is more favorable as far as both production time and tool life are concerned, without requiring any greater power. (This is due to the fact that the specific cutting pressure decreases with increasing chip cross-sectional area, as found in metal cutting research.) On the other hand, however, we encounter a large increase in the feed rate, affecting both the surface roughness and the cutting force. It is obvious that the forces on the machine and on the shell are increased considerably as against example A. Thus the tendency of the machine to deflect will increase accordingly and the accuracy of the turned shell will decrease. A calculation reveals that the cutting force is 1000 lb. per tool in example A and 1650 lb. in example B. Considering all 3 tools, the total force tending to deflect the machine increases from 3000 to 5000 lbs. The horizontal components of this force tending to deform the shell and to dislocate it in the fixture and center increase accordingly and thus the eccentricity of the shell will increase. It is therefore important not to go to the extreme in the use of low speeds and large feeds!

Example C is to explore the case of using sintered-carbide tools at a cutting speed of 300 fpm. It is marked by cross symbols (see Fig. 2).

It will be seen that the shape ratio is between 1:15 and 1:25 giving a feed rate of 0.007" per rev. The tool life is 200 hours. Machining time is 1.45 min per shell. Cutting force is only 350 lbs. per tool.

Example D with 180 ft. per min. cutting speed is marked by circles (see Fig. 2). Feed rate 0.013" per revolution with 550 hours tool life and 1.3 min machining time per shell. Cutting force is now 550 lb. per tool.

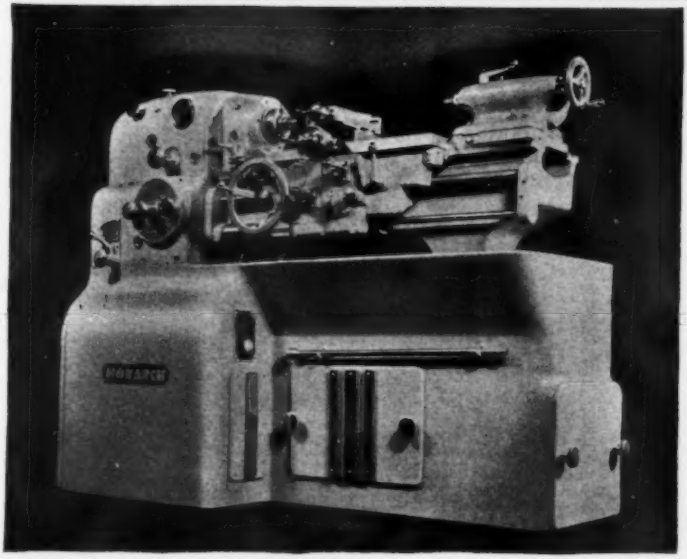
It will be noticed that the machining time with high-speed-steel tools is more than favorable than with sintered carbides, but obviously the machined surface will be rougher (owing to the high feed per revolution) and the deflection of the machine will be greater.

Example B will give the maximum shell production but the finish will probably be too rough to meet the specifications. Example A gives a production which is 8 per cent lower than B, but the finish will be considerably better. The tool life, however, is low (1.6 hours), but this may still be satisfactory if the time required for tool changing is low.

5 H.P. per Tool Examples

The last four examples deal with determining the coordination of the cutting variables if a 15-h.p. machine is available, delivering 5 h.p. per tool at the cutting edge. The general procedure is the same as just discussed.

Example E refers to using high-speed steel at 100 ft. cutting speed. It will be seen immediately that the intersection of the 5-h.p. line and 100 speed line is outside of the chart, thus indicating that such a combination would not give practical results.



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EXAMPLE	FEED ASSUMED	SPEED	R.P.M.	RATIO	TOOL	H.P./TOOL	TOOL LIFE
a —	.010	284	344	1:10–1:15	SINT. CARB.	3.9	75
b +	.020	147	172	1:7–1:10	SINT. CARB.	3.4	420
c ○	.030	98	114	1:3–1:5	H.S.S.	3.25	1.1
d □	.040	73.5	86	1:3	H.S.S.	3.2	2.4

FIG. 3—SHELL MACHINING CHART:—EXAMPLES FOR SELECTING AND SETTING THE REQUIRED MACHINES IF THE TURNING OPERATION ON THE OUTSIDE DIAMETER OF A 75-MM SHELL IS TO BE TIMED WITH PRECEDING OR LATER OPERATIONS

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(The tool life would be only approximately 12 min.)

Example F shows the results of reducing the speed to 60 fpm and is marked by double-cross symbols. The feed rate at ⅛" depth lies also outside of the field of the chart (that is, beyond the range of feed scale), thus showing that it would be too large for practical purposes.

High-speed-steel tools **cannot** be considered in the 5 h.p. cases.

Example G for sintered carbide at 300 fpm and 5 h.p. per tool (marked by a "winged dot," Fig. 2) shows a feed rate of 0.013" per revolution and a tool life of 26 hours, with a production time of only 0.78 min.

Example H, finally, for 180 fpm speed and 5 h.p. per tool (marked by a square, Fig. 2), gives a feed rate of 0.024" per revolution and a tool life of 66 hours with a production time of 0.70 min. per shell. This is obviously the best result obtained in all examples. A feed rate of 0.024 is not too large involving a cutting force of 920 lb. per tool. The tool life is also satisfactory.

General Conclusion

It is naturally not pretended that the shell-machining chart represents "the last word," but we believe that it could be useful, especially if it is employed as a basis for exchange of experience in shell machining. It might be worthwhile to clear such an exchange through an office of the Ordnance Department in order to obtain values for improving the chart and to advise the manufacturers as to the latest performance figures in shell production.

From the foregoing examples it can be concluded in general that the maximum shell production depends to a large extent on the horsepower available at the cutting edge in combination with the cutting speed the tool can stand.

We have here the same basic problem as in many other lines of engineering (compare aviation), namely, to obtain maximum results by using high powered machines at high speeds, permitting low forces. The higher the power, the shorter the production time; the power should be utilized by a speed high enough to permit reasonably low feed rates with relatively small forces and deflections; the feed rate should, however, not be too low, since the production time would be increased in this case as can be seen from the foregoing examples.

These examples indicate that sintered-carbide tools will be useful on high-power machines since they permit the required cutting speeds, thereby keeping the feed rates within reasonable limits. On the other hand, high-speed-steel tools are preferable in the case of the many low-powered machine tools immediately available in many small shops all over the country, the owners and operators of which are as eager as any of us to participate in the defense of America.

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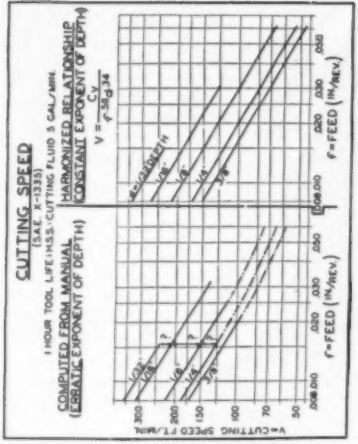

Fig. 4 — Computation of cutting speed from manual.

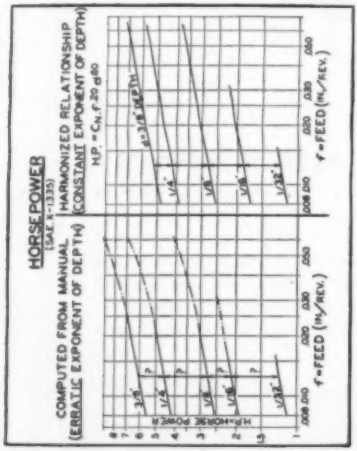

Fig. 5 — Computation of horsepower from manual.

Appendix

A third chart (see Fig. 3) has been prepared referring to the machining of 75-mm shells. The examples deal with the case that a certain machining time, say 1 min., is prescribed.

Such cases may occur in a production line if the operation of turning the outside diameter has to be timed with preceding and later operations. The proper setting of speed and feed and the selection of the required machine is investigated and also the resulting tool life determined.

In this case a simple calculation must precede the use of the chart. We have to find at first the relationship between speed and feed for obtaining 1 min. machining time. This is derived in the following way:

Let t = machining time, min.
L = length of cut, in. (= travel per tool)
f = feed, in. per revolution
D = diameter of work piece, in.
v = speed, fpm
n = rpm

Then

$$t = \frac{L}{f\,n} = \frac{LD\pi}{f\,12\,v} = \frac{0.262\,LD}{f\,v}$$

If $t = 1$

$$v = \frac{0.262\,LD}{f}$$

And if $L = 3.55$ and $D = 3.30$

$$v = \frac{2.94}{f}$$

We see that the product of speed and feed must always be 2.94 in this case for a machining time of 1 min. We may assume any feed and calculate the corresponding speed, and vice versa. Four examples, a, b, c, and d have been worked out on Fig. 3, and the results are tabulated at the bottom of the chart.

In all these cases the machining time would be 1 min. per shell. The most

advantageous case is example b, giving 420 hours tool life with a feed rate of 0.020 producing an adequate surface.

tween the changes in the depth of cut and the cutting speed as shown on the

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advantageous case is example b, giving 420 hours tool life with a feed rate of 0.020 producing an adequate surface. A machine must be selected or an available machine must be rebuilt to permit 172 r.p.m. and 3.4 h.p. per tool at the cutting edge. Sintered carbide tools must be used.

Theoretical Comments

It may be of interest to discuss briefly some scientific relationships concluded from the Manual. Plotting the cutting speed values computed from the Manual for SAE X-1335, 5 gpm cutting fluid, high-speed steel, 1 hr tool life, on double logarithmic paper gives the diagram shown at the left-hand side of Fig. 4. It will be noticed that the distance of the lines representing the depth of the cut is erratic (as indicated by question marks). Doubling the depth of cut from 1/32 to 1/16" shows a relatively small change in the admissible cutting speed, while doubling the depth from 1/16 to ⅛" would affect the cutting speed to a considerably greater extent; but further doubling the depth (or from ⅛ to ¼") has again a smaller effect on the cutting speed. There is no apparent reason for this and no tests known to us which show such erratic relationships. The slight bending of the depth lines indicates the effect of the variation in multipliers for cutting fluid.

It has, therefore, been found advisable to harmonize the relationship between the changes in the depth of cut and the cutting speed as shown on the right-hand side of Fig. 4; this represents the best proposition we can offer at present.

Correspondingly, the erratic relationship between feed, depth, and horsepower has also been harmonized as will be seen by comparing the left- and right-hand sides of Fig. 5.

Regarding formulas derived from the harmonized curves, it may be said that they confirm conclusions from tests with other materials and that they permit to specify the following characteristic values for SAE X-1335:

1 The admissible cutting speed for the same tool life decreases only 26 per cent if the chip shape (feed-to-depth proportion) is changed from deep to shallow, i. e., in a ratio of 1:12.5, (which is the largest change occurring in practice) but as much as 68 per cent if the chip cross-sectional area is increased by a ratio of 1:12.5.

2 The horsepower required decreases only 26 per cent if the chip shape is changed from deep to shallow, but increases 180 per cent in the case of a coresponding change of the chip cross-sectional area.

3 The cutting forces decrease only 19 per cent in case of a change of the shape by 1:12.5 as against 780 (!) per cent in case of such a change of the area.

Thus, it is obvious that the major factor affecting the relationships is the chip cross-sectional area and the minor factor the shape of the chip. The shell-machining chart takes both changes into consideration.

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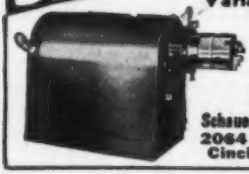
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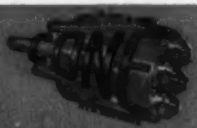

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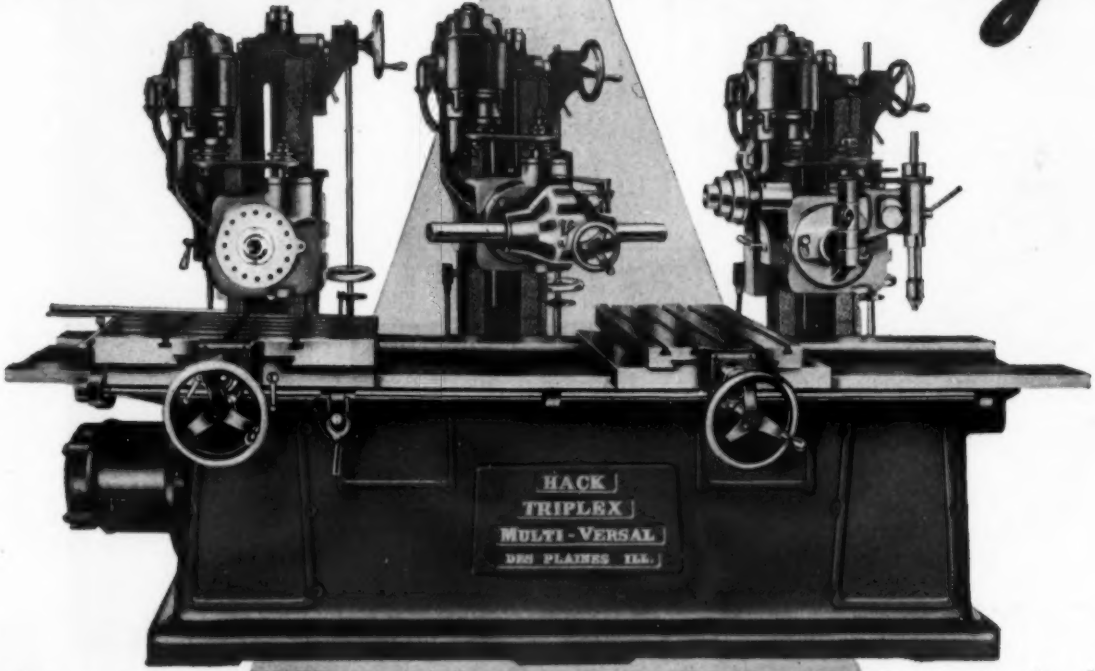

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RESISTING

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By R. L. LERCH

COBALT - chromium-tungsten alloys have long been used in the form of high-speed metal-cutting tools, and also as welding rods for hard-facing metal parts subjected to abrasive wear. In recent years, the alloys have been adapted to an ever-growing list of applications in the form of castings and forgings of many types for conditions of severe abrasion, accompanied often by corrosion or heat or both. Their excellent resistance to abrasion, heat and corrosion assures long, trouble-free life and results in substantial savings in operating costs.

Cobalt-chromium-tungsten alloy specialties are made to users' specifications, being cast to shape, then ground, lapped or polished to the required degree of surface finish. Castings as small as phonograph needles and as large as 10-lb. punches are now made from one of these alloys. Forged or rolled products, such as cutting-machine knives, are hot-rolled from one of the malleable grades of the alloy but most of the products are cast from the harder grades. Often these specialties are fabricated into composite parts, wherein the alloy is brazed to a steel base in such a manner that the alloy surface is exposed to the abrasive or corrosive conditions to be encountered, while the steel, forming the bulk of the part, serves as a tough, strong backing and keeps down the cost of the part.

Fig. 1—Dies weighing up to 10 lbs. each are cast of solid Stellite alloy.

Castings for Abrasive Wear

It is the combination of inherent hardness and high abrasion resistance of cobalt - chromium - tungsten alloys that in many instances justifies their use as solid castings in place of special steel, or even hard-faced parts. For example, an electrical manufacturing company has found solid castings economical for certain punches and dies (Fig. 1) which weigh as much as 10 lbs. per unit, because the relatively high initial cost, compared to the cost of steel, is more than offset by the longer life. Furthermore, Stellite alloy parts have a substantial scrap value after they are no longer usable.

An added factor often justifies the

use of castings in place of hard-faced parts, which are steel parts protected by a welded-on coating, edge, or point of cobalt-chromium-tungsten alloy. This is the fact that the cast alloy possesses a little greater hardness than that of the hardest standard grade of hard-facing alloy in the as-welded condition. Castings are ths more resistant to abrasion and have a longer life. The wearing surface of solid cast parts also has a backing which will not mushroom under impact as might a steel base of insufficient hardness.

All finishing of parts cast of these alloys is done by grinding. For some requirements, where close tolerances are unnecessary, they can be used without any finishing. The casting shown in Fig. 2 has cored holes which were cast accurately enough to require no finishing. Other parts, such as the bushing sketched in Fig. 3, are ground only on certain surfaces. The 1" inside diameters were left as-cast, while the other diameters were finish-ground to the tolerances indicated.

The small pins shown in Fig. 4 are centerless-ground to size. When one end is then beveled to a point, the pins become refrigeration expansion-valve needles. These needles are a standard

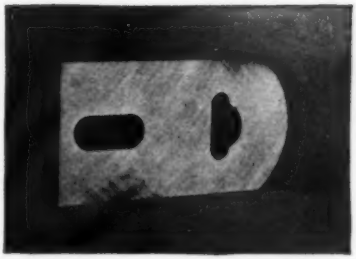

Fig. 2—This casting of Stellite alloy has cored holes which were cast accurately enough to require no finishing.

part of a well-known refrigeration unit, and they have such a long life, in spite of both erosive and corrosive service conditions, that they require little, if any, attention during the life of the unit.

The use of these alloy specialties as machinery parts for abrasion resistance prevents many costly shutdowns for replacements and much of the expense of replacement parts. Often, the reduction in machine down time alone makes the use of alloy parts economical. The wearing parts (Fig. 5) for machines used in the manufacture of cans are

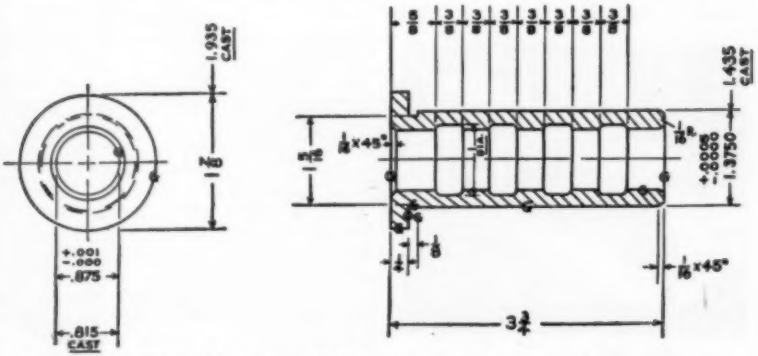

Fig. 3—This bushing is ground all over except for the 1-in. inside diameters.

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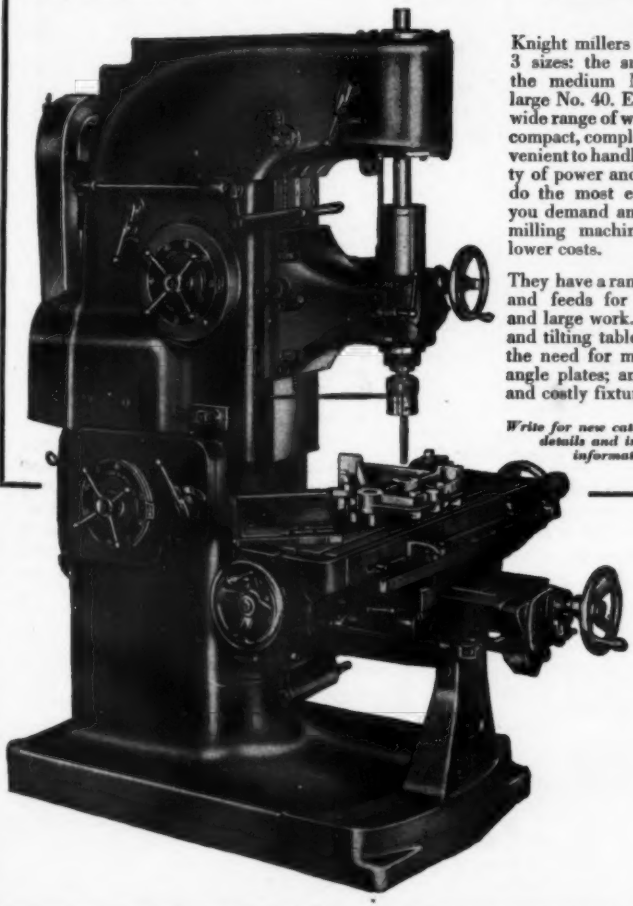

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an example. These parts are made of cast alloy to insure long service life at high production speeds.

Castings for Corrosion Resistance

Frequently, abrasion is combined with corrosion or heat and the severity of the wearing action is materially increased. Because these alloys resist corrosion and heat, as well as abrasion, the field of usefulness of parts made from these materials is further widened.

For some years, cast cobalt - chromium-tungsten alloy parts have been

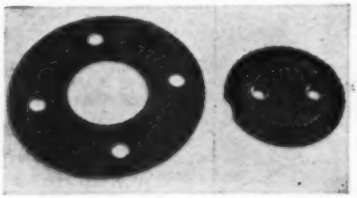

Fig. 5 — These cast alloy wearing parts are for machines used in the manufacture of cans.

used in the manufacture of dry batteries, to resist wear and corrosion. The alloy is so highly resistant to chemical action that in some applications it retains a high polish and smooth

Fig. 4—These ground pins are to be pointed to make expansion-valve needles for refrigeration units.

surface even after years of such service. Cast core molds, dies, and other parts, shown in Fig. 6, represent a few of the items used in dry-cell manufacture. Most of these parts are subjected both to abrasive wear and corrosion, like the battery machine parts shown in Fig. 7 which must be finished to close tolerances and retain these tolerances during use.

Pigment - grinder mill rotors, as shown in Fig. 8, are a proved application for this alloy in corrosive and abrasive service. In another instance, the bearing surface of a certain type of water-straining equipment for industrial uses must resist both abra-

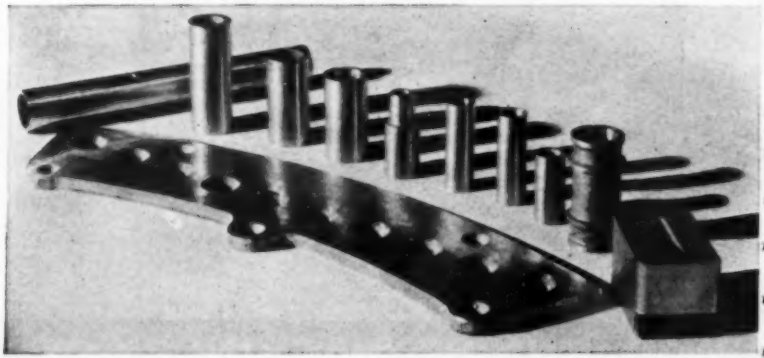

Fig. 6—Here are typical core molds, dies, and other parts cast from Stellite alloy and used in dry-cell manufacture

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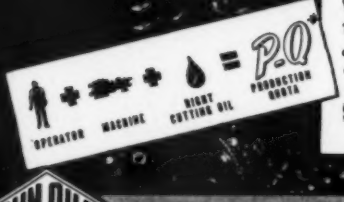

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Fig. 7—These are cast and finish-ground battery machine parts.

sion and corrosion. An alloy bearing for a 12" strainer is shown in Fig. 9.

Castings for Heat Resistance

While metal-cutting tools are probably the most common application illustrating the heat resistance of these alloys, the alloys' high red hardness plays an important part in many other instances. Cylinders and pistons for babbitting machines, shown in Fig. 10, are a typical example. These parts resist the heat and corrosive action of molten babbitt metal in a casting machine.

Bushings for coal stokers and roller guides for hot steel in steel mills are other parts made of cobalt-chromium-tungsten alloy to withstand abrasion and heat. A specialty involving continuous high temperature is a "burning element" used in a machine for stripping the insulation off covered wire. In all these instances, the use of these alloy parts has solved difficult problems.

Surface Advantages

Surfaces of cobalt-chromium-tungsten alloy, when polished or lapped, take a high, mirror-like finish, and this is unmarred by atmospheric action or by a number of conditions that would corrode many other metals. This feature has led to the alloy's use for burnishing tools, to impart a smooth, hard surface to steel parts. Several styles of burnishing rollers are used for finishing

Fig. 8—Pigment-grinder mill rotors of Stellite alloy resist the abrasion and corrosion of paint pigment.

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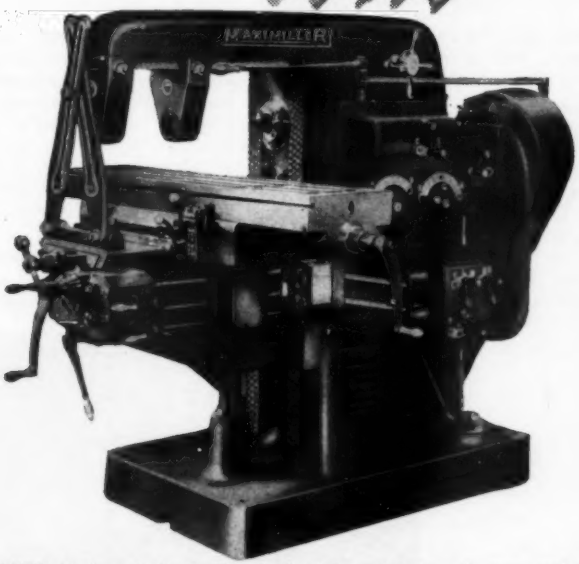

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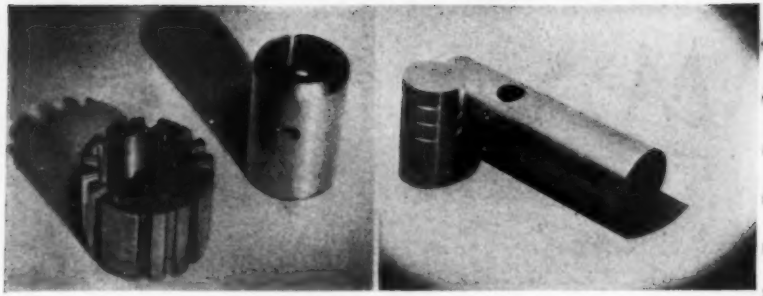

Fig. 9 (left)—In a certain type of strainer, this cast alloy bearing resists corrosive effect of the liquid being strained, and the abrasion from the two parts working against each other and from particles passing through. The bearing is lubricated only by the liquid. Fig. 10 (right)—Pistons and cylinders for babbitting machines are cast of Stellite alloy to resist the heat and corrosion of molten babbitt metal.

railroad car and locomotive axles and journals, and locomotive crank pins. One of these is shown in Fig. 11.

Another property found in these alloy surfaces is a low coefficient of friction. The average coefficient of friction of dry, polished surfaces of these alloys, measured by the angle of repose, is 0.11 to 0.13. For ground surfaces, it is 0.13 to 0.15. This low value helps to explain the fact that pump packing lasts many times longer in contact with such alloy surfaces than with ordinary bearing surfaces. Wherever lubrication is impossible to unreliable, the low coefficient of friction and freedom from corrosion of these alloys are of great value for numerous purposes because of their long life. Experience has shown that the use of these alloys, working against casehardened steel on bearing surfaces, gives excellent results.

Fabrication of Composite Parts

A common method of fabricating composite parts of Stellite alloy and

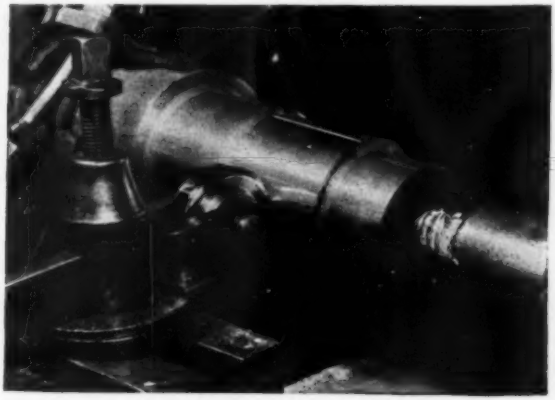

Fig. 11—Cast Stellite alloy burnishing rollers are used in burnishing locomotive crank pins.

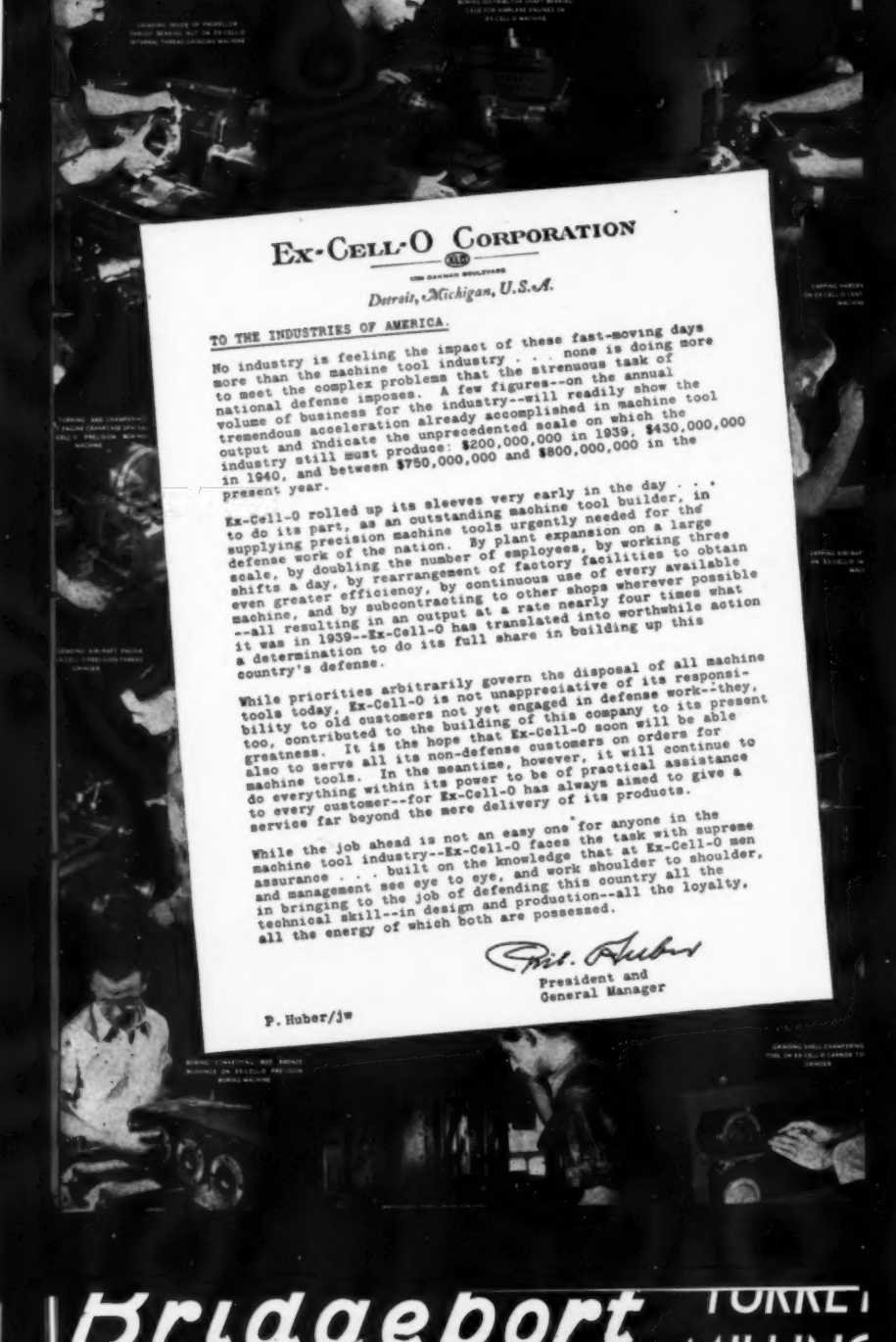

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Fig. 12—These are typical bars protected by composite wear strips fabricated of steel with brazed-on Stellite alloy strips.

steel is by brazing. Wear strips for driving, pilot, and boring bars are a typical example of parts fabricated by this method. These standard wear strips, shown on various bars in Fig. 12, are also for use in jigs, fixtures, chucks and indexing stops. A somewhat similar application of composite parts is in connection with work rests for centerless grinders, like the one shown in Fig. 13. Such rests are widely used and have been fabricated in sizes up to 54" long.

Physical and Chemical Properties

The physical properties of the alloys commonly used for these "specialty" applicaitons are given in Table I, while some of their chemical properties are shown in Table II. The alloys are somewhat heavier than steel, they have good strength in the cast form, and the strength of the rolled or forged al-

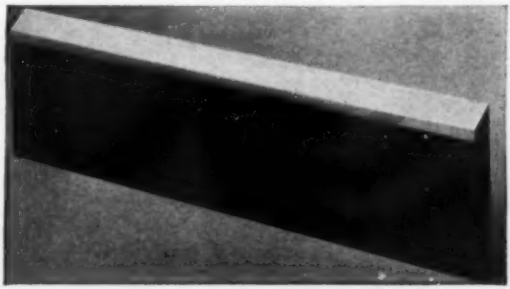

Fig. 13—Centerless - grinder rests are protected by a brazed - on blade of Stellite alloy.

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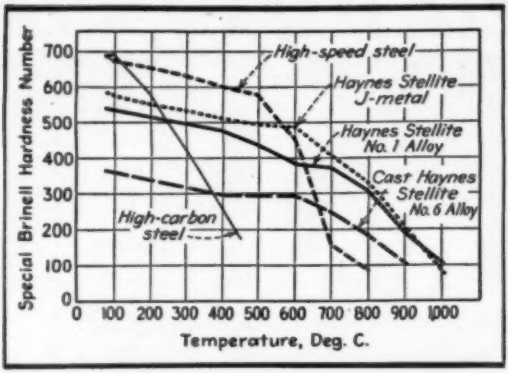

Fig. 14—Hardness of high-carbon steel, high - speed steel, and Stellite alloys at elevated temperatures. The cobalt-chromium - tungsten alloys have high hardness at temperatures above 600 deg. C. (1,112 deg. F.).

loy is 130,000 lb. per square inch.

Probably the most important physical property, demonstrated in Figs. 14 and 15, is the alloy's retention of hardness at temperatures above 1,100 deg. F. This means that when surface layers of the material are heated to high temperatures by friction and pressure, they remain hard and resistant to abrasive wear. As the alloys are practically unaffected by heat-treatment, their recovery hardness after being heated into the red-heat range and then cooled to room temperature is practi-

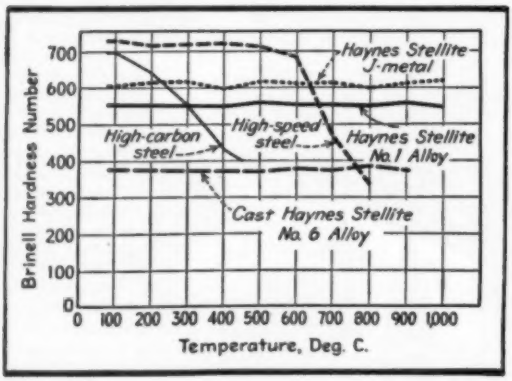

Fig. 15—Recovery hardness after cooling from temperatures up to 1,000 deg. C. 1,832 deg. F.). Cobalt-chromium - tungsten alloys are practically unaffected by heat-treatment.

TABLE I

Physical Properties of Haynes Stellite Cobalt-Chromium-Tungsten Alloys

Properties	Cast J-Metal	Rolled No. 6 Metal
Specific Gravity, g. per cu. cm.	8.76	8.38
Melting Point, deg. C.	1,270	1,275
Tensile Strength, lb. per sq. in.	65,000	130,000
Elongation in 2", per cent	0	2
Hardness, Rockwell C	61	40-45
Magnetic Permeability at 200 oersteds	less than 1.2	

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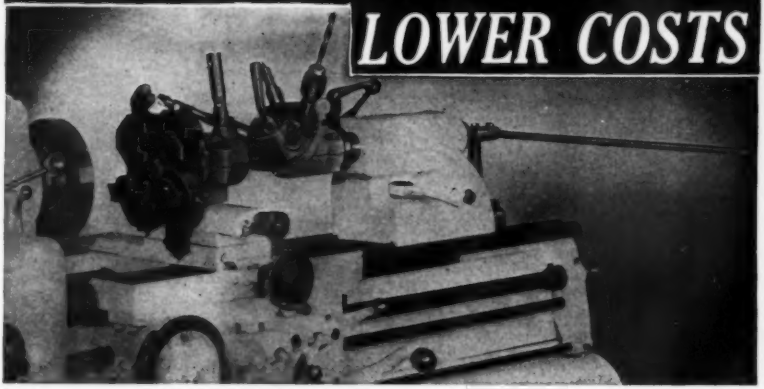

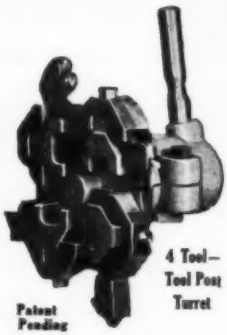

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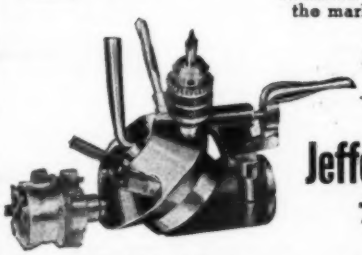

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TABLE II

Chemical Properties of Haynes Stellite Cobalt-Chromium-Tungsten Alloys

Penetration Test Results in Inches per Month			Haynes Stellite Alloy No. 1	Haynes Stellite Alloy No. 6
Tests in Wet Chlorine*	Saturated Vapor	Room Temp.	No Measurable Penetration	0.026
Tests in Sulphuric Acid	10%	Room Temp.	No Measurable Penetration	0.000034
		Boiling Point	0.019	0.541
	77%	Boiling Point	0.102	Sample Destroyed
Tests in Nitric Acid	10%	Boiling Point	0.0003	No Measurable Penetration
	Concentrated	Boiling Point	0.022	0.172
Tests in Hydrochloric Acid		Room Temp.	0.002	0.018
	10%	Boiling Point	0.287	0.176
	Concentrated	Boiling Point	0.036	24.0

Penetration Test Results in Inches per Month			Haynes Stellite Alloy No. 1	Haynes Stellite Alloy No. 6
Tests in Phosphoric Acid	30%	Boiling Point	0.0017	0.00014
Tests in Acetic Acid	10%	Boiling Point	No Measurable Penetration	0.00024
	Concentrated	Boiling Point	No Measurable Penetration	0.0003
Tests in Ferric Chloride	10%	Room Temp.	No Measurable Penetration	0.0095
		Boiling Point	0.0063	0.172
	30%	Room Temp.	No Measurable Penetration	0.051
		Boiling Point	0.10	0.575
Tests in Cupric Chloride	10%	Room Temp.	No Measurable Penetration	0.0081
		Boiling Point	0.069	0.243
	30%	Room Temp.	No Measurable Penetration	0.032
		Boiling Point	0.106	0.777
Tests in Ferric Sulphate	10%	Room Temp.	No Measurable Penetration	0.0001
		Boiling Point	No Measurable Penetration	0.00017
Tests in Sodium Hydroxide	30%	Boiling Point	0.0010	0.0037
Tests in Potassium Bichromate	20%	Boiling Point	No Measurable Penetration	0.00017

*Samples suspended in sealed bottle through which chlorine gas was constantly bubbling.

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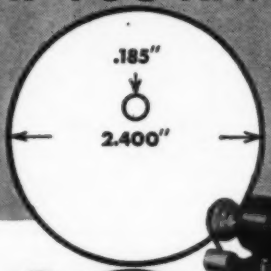

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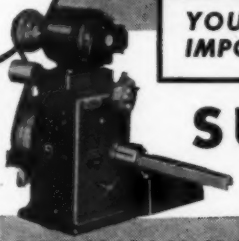

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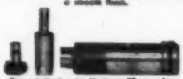

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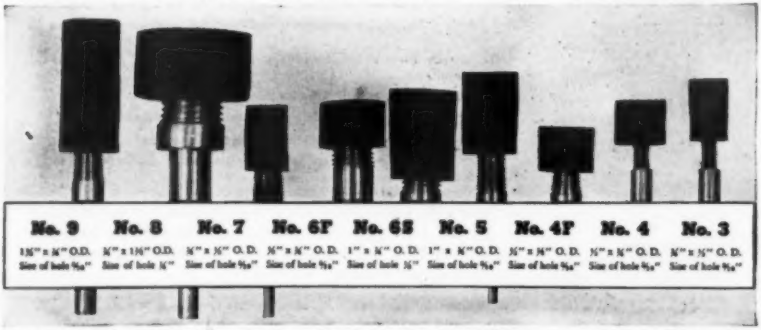
cally a horizontal line with respect to temperature.

In obtaining the values in these graphs of hardness, ⅝" cube samples and a tungsten carbide indenting ball were surrounded by a furnace and were heated to the temperature indicated for ½ hour. Then the Brinell hardness test was quickly made at these temperatures These same samples were then allowed to cool to room temperature and the hardness was measured in the usual way. For Fig. 14, the tests were made at every 100 deg. C. for the metals indicated. In Fig. 15 the recovery hardness of the same metals was measured on samples heated to, and cooled from each multiple of 100 deg. C. up to 1,000 deg. C.

Stellite cobalt-chromium-tungsten alloys possess excellent resistance to corrosion by many of the commonly used chemicals. This property, combined with the abrasion-resisting quality of the alloys, accounts for their being doubly economical under conditions involving both corrosion and abrasion. Table II shows results of laboratory tests on two of the more widely used grades. All results are expressed as the rate of penetration in inches per month, calculated from loss of weight after a 15-hour test run. The concentration of the solutions is expressed as percentage by weight.

It should be remembered when using the values of physical and mechanical properties and penetration-test results, that they are averages and average ranges obtained with a limited number of specimens. Slight variations from the figures given may sometimes be observed in a single specimen. The figures do serve, however as a guide for the engineer or designer who is planning equipment made of these materials.

FLEXIBLE ABRASIVE WHEELS



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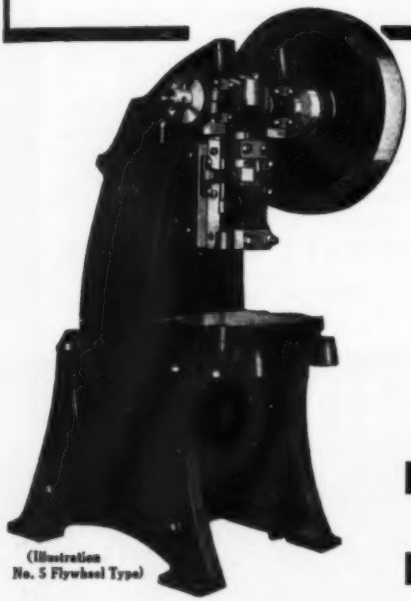

(Illustration No. 5 Flywheel Type)

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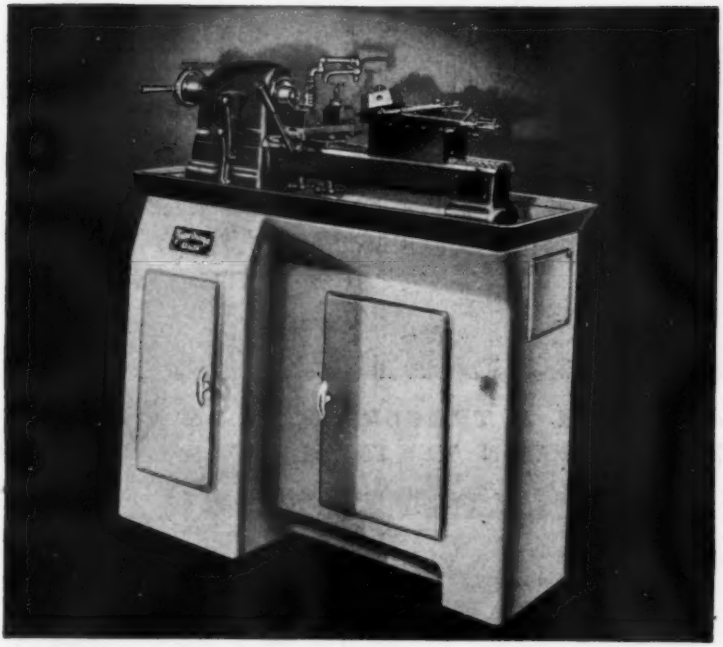

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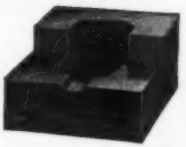

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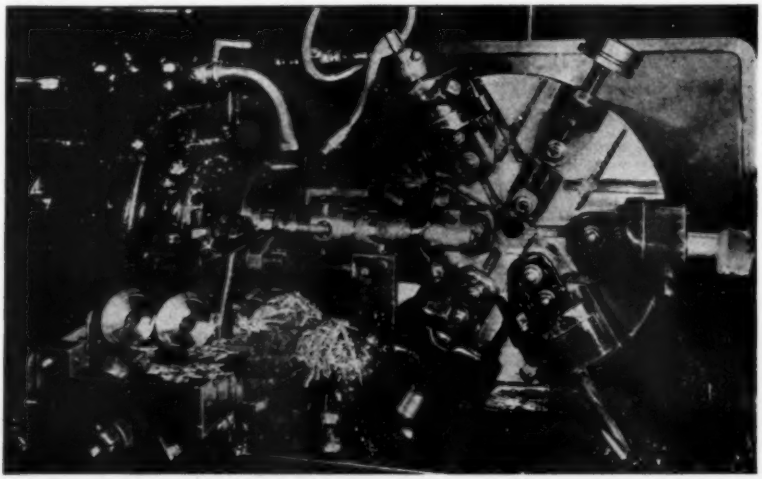
Threading Light Metals

By H. A. PAINE

ALONG with the recent expansion of the aircraft and allied industries has come a great increase in the use of parts made of the new light weight compositions, principally aluminum and its alloys, but also of magnesium and its alloys. Sub-contracting of many of these parts has resulted in many plants being called upon to cut threads on these materials without benefit of the detailed experience in this type of work which has been accumlated by the aircraft manufacturers and their allied industries. This situation has prompted the writing of this discussion.

The two principal requirements of the aircraft industry in regard to these alloy parts are thread accuracy and good thread finish, which will be treated in order. The first step in obtaining accurate threads is to buy chasers specifically made for threading the particular metal or alloy. All chaser manufacturers have gone to



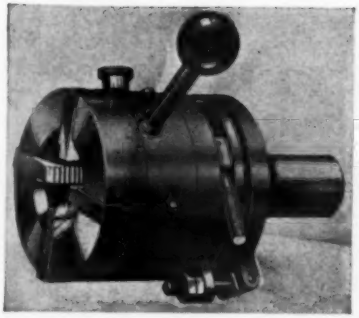
A typical set-up for production of threaded light alloy parts.

great lengths to determine proper clearances, grinds, etc. for each material, and they prefer to have the metal specifications given when ordering.

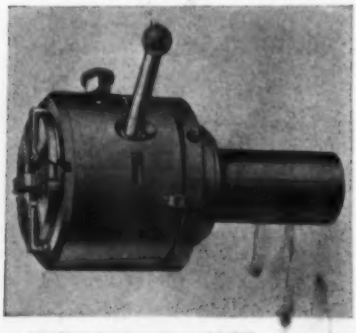
Having the chasers properly made, however, is of no use if the die heads or taps in which they are used are in poor repair. Make sure the tools are in good shape, if necessary having the manufacturers make needed repairs. The same thought must be carried out concerning the machine tools on which the die heads or taps are to be used. Spindles must be tight and true-running, and the alignment between spindles and tools should be as nearly perfect as possible.

These factors are vitally important in the accurate threading of any material, but the soft nature of the aluminum and magnesium alloys allows external inaccuracies to affect the thread being cut to an even greater extent, placing special emphasis on machines, die heads and taps being kept in first-class condition.

If it is necessary to run a job involving the threading of these materials on a fairly heavy machine, or one having a heavy turret, it is usually good practice to use a die head with a buffer or cushion action, such as those illustrated, in order that the operator will not have to rely on "feeling" the lead of the thread as he feeds the turret forward on the work. This is also recommended for machines having camfed turrets. Collapsing taps also may be mounted in this way, although the practice is not so general. Die heads having outside tripping mechanisms are recommended for short or fine threads, in order to relieve the threads being cut of the tripping strain of the conventional pull-off type of tool, which sometimes causes shaving or marking of the threads. Examples of such die heads are illustrated.



A DD-18 die head incorporating a buffer action.



A buffer action is also provided in this typical KH2 die head.

Considerable emphasis has been placed on ground thread chasers recently, and jobs involving extreme accuracy sometimes justify the additional expense of this type of tool. This is particularly true when the job requires a sharply defined thread form.

The requirement of good thread finish places double emphasis on several of the recommendations previously made. In the first place, ordering the chasers for the specific material to be threaded, giving in addition to the analysis or specification number, the form of the metal, i. e., bar, casting, tubing, die casting, etc. Also checking up on the proper condition of the die head or tap, and condition of the machine. Further than this, chasers must

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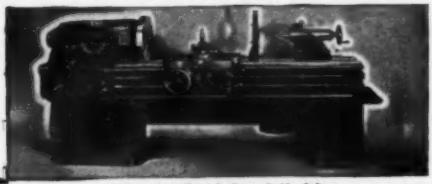
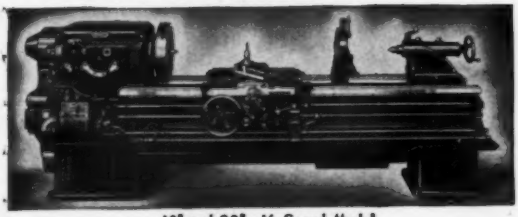
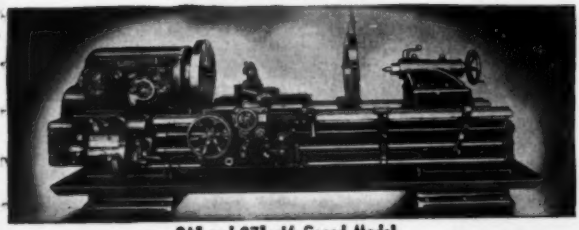


14" and 16"—16 Speed Model



18" and 20"—16 Speed Model



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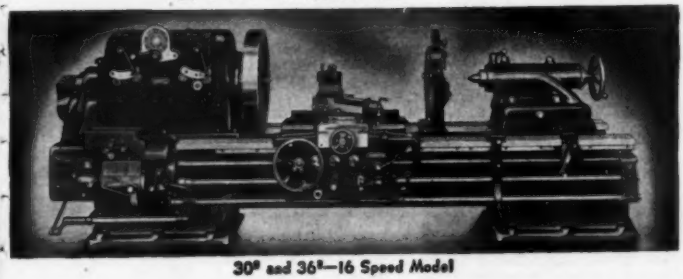

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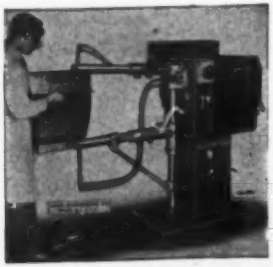

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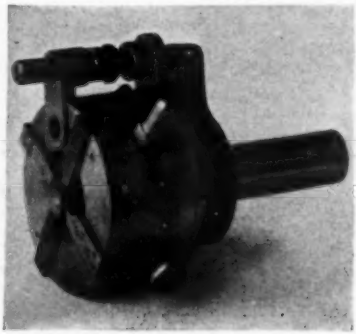
be kept sharp, and cutting edges must be smooth. Very often, hand stoning of the chamfer (or lead as it is sometimes called) and cutting face of the chaser adds a great deal to thread finish, since in addition to producing a keen edge without burrs, it reduces the tendency of the material to load on the cutting face.



An outside trip is provided on this typical DS26 die head.

One of the most important aids to good thread finish on these materials is a chaser which cuts extremely freely. For aluminum and magnesium in bar form, also in tube form, standard angle hook or rake is usually sufficient, but for both sand and die castings, steep radial hooks have been found most suitable. The radius of the hook should be large enough to provide plenty of room for the chip to curl, and generally should meet the crests of the chaser teeth at an angle of 20 or 25 degrees. The chamfer or lead of the chaser should be at least two threads if the design of the part permits, and if the design does not permit, it should be changed if at all possible. Avoid one-thread chamfers if good thread finish and long chaser life are desired. More than standard chamfer clearance is also beneficial, since this produces a freer

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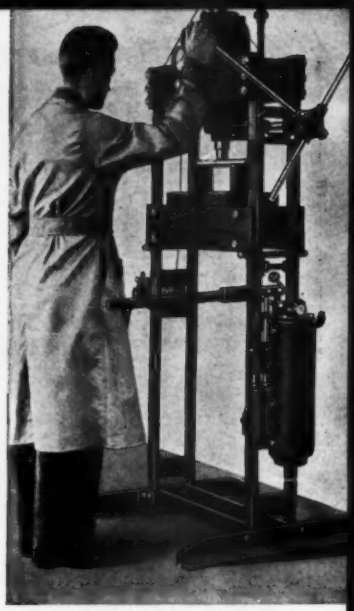
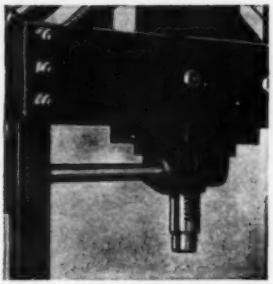
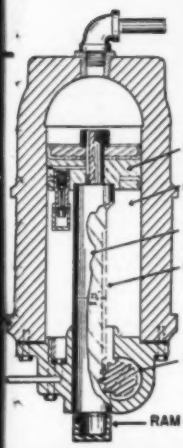


Above: Showing use of Mechanical Arbor Press to straighten bar supported on KRW All-Steel V Blocks. Note sliding handle in "Capstan" type handwheel is extended for increased leverage.



Above: Rear view showing rack and pinion mechanism controlled by "Capstan" type hand-wheel.



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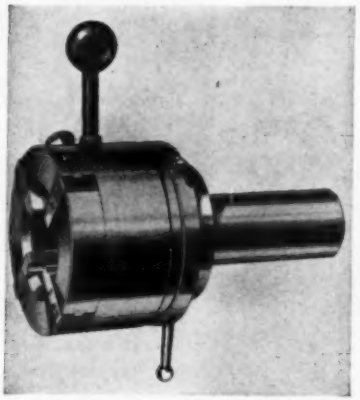
cutting action, and permits easier starting of the chaser on the thread. A keen cutting edge is of utmost importance in work of this type.

The correct lubricant or coolant has an important bearing on the quality of thread finish. Bar aluminum is threaded satisfactorily by using paraffin oil with about 10 per cent of lard oil, but better performance is obtained by employing kerosene with enough lard oil added to give the solution a little body. With castings, kerosene is much superior to anything else. Occasionally, however, when parts are made of the high-silicon aluminum alloys, sulfur-base thread cutting oil seems to be the only lubricant which will produce smooth threads. Paraffin



This C54 die head is also provided with outside trip.

oil is usually best for threading magnesium and its alloys, although care must be taken that the flash point of the oil be above 300° F., as magnesium ignites at comparatively low temperatures and precautions are essential to guard against fires. Threading speed is, as with any material to be threaded, determined by the machinability of the

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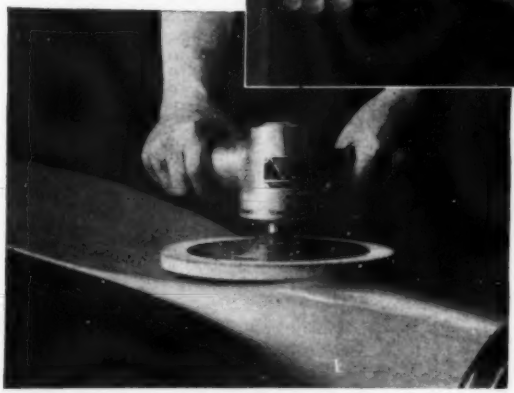

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metal and by the fineness or coarseness of the thread. The finer the thread, the higher the speed that may be used and should be used in order to produce threads having a good finish. All the threading tool manufacturers have charts available which give speed recommendations and are willing to cooperate in solving threading problems of all kinds.

As in the preceding discussion of thread accuracy, chasers having ground threads sometimes will produce better results from the standpoint of thread finish than standard cut-thread chasers, but it cannot be claimed that ground thread chasers are a conclusive answer to thread finish troubles. On these materials, a chaser primarily must cut freely, and if it does not, whether it be cut thread or ground thread, the threads it cuts will be rough and torn. This, of course, also has an adverse effect on the accuracy of the finished work.

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It should be self-evident that these alloys, especially when in casting form, must be free from flaws such as blowholes, inclusions etc., if good thread finish is to be maintained. Our company received a complaint recently that certain collapsing tap chasers were producing rough threads. We were able to improve the results somewhat by using a steeper radial hook grind on the cutting face of the chasers, but we found a large part of the user's difficulty lay in the castings. The thread was a rather fine one, and the aluminum castings were so filled with tiny holes that the threads appeared to be torn, whereas upon close inspection it was observed that between the holes the threads were quite smooth.

One of the more frequent complaints made in connection with thread cutting on aluminum and magnesium alloys is the short life of the chasers. This reemphasizes the importance of giving specifications of the material to be threaded when ordering chasers, so that the manufacturer may, in addition to furnishing chasers with proper grinds and clearances as discussed previously, give the chasers the proper heat treatment so they will resist the abrasive action of the aluminum or magnesium to the greatest possible extent. Further than this, practically all of the factors discussed in connection with the production of smooth threads influence chaser life in the same way in which they influence thread finish. That is, keen, smooth cutting edges and steep radial hooks shear the metal more easily and greatly reduce the abrasive effect of these materials, as do the use of proper lubricants, threading speeds, and long chamfers. Many users have greatly improved chaser life by arbitrarily establishing a standard number of pieces to be threaded between grinds, issuing rigid instructions to machine operators that when this

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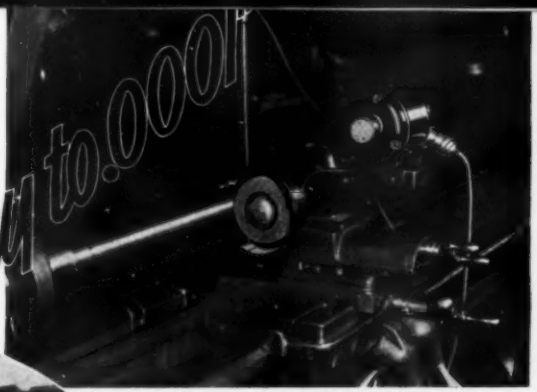

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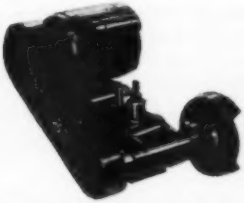

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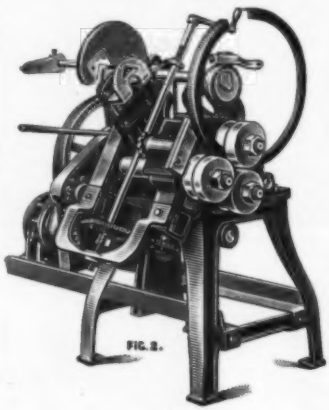

FIG. 2.

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number of pieces has been reached, the chasers positively must be resharpened or replaced with a freshly resharpened set. This arbitrary number of pieces must be determined by experiment, but if the procedure is to be effective, should be set so that chasers are resharpened as soon as they become only slightly dull. In this way resharpening involves only light touching up of the chamfer or cutting face as the case may be, and many grinds and long life may be obtained. If the contrary method is followed, that of allowing chasers to run until they become so dull that they will not work properly, heavier grinding in resharpening will be necessary, reducing greatly the total number of grinds obtained from the chasers, and reducing in direct proportion, the number of pieces threaded with any given set of chasers.

Chasers with long chamfers will cut more threads between grinds than chasers having a short chamfer and consequently more pieces per set of chasers. If at all possible, parts should be designed to allow the use of chasers having long chamfers, and to permit sufficient clearance between the last full thread and any shoulder which may be necessary, to reduce to a minimum the danger of striking the shoulder with the chasers.

To sum up the matter, if you are going to cut threads on aluminum, magnesium, or any of their alloys, use chasers tailor-made for the job. Use a die head or tap and machine which are in good condition, and the proper speeds and lubricants. Keep your chasers sharp and smooth, making sure there are no grinding burrs left which will spoil the thread—and use ordinary care.

(Illustrations—courtesy Geometric Tool Co., New Haven, Conn.)

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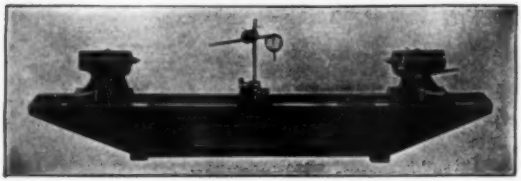

Outstanding for convenience and economical high quality, Sundstrand Bench Centers are extensively used in toolrooms, production departments, repair shops. They facilitate testing and straightening operations; stand up reliably in continuous service; cut costs and increase output.

Made in 7 standard sizes from 6" x 18" to 12" x 60" Sundstrand Bench Centers provide suitable capacities for widely varied requirements. All are fully portable; may be moved about as desired and set on a convenient bench or stand. Heads are readily adjustable on the rigid bed, securely locked by lever-clamp gibs. Centers are hardened and ground steel, with accurate taper fit in spindles. Right hand spindle is spring-loaded; has retracting lever for quick work-handling, and locking lever for heavier work.

Improve your between-center checking operations with Sundstrand Bench Centers; save time and money. Write for information. Investigate today.

● Illustrated Bulletin SBT-436 gives full details on Sundstrand Bench Centers. *Write for your copy today;* and ask for name of nearest dealer.

DEALERS—Sundstrand "Open Line" includes Bench Centers described above, Balancing Tools, and Manual Index Bases. These high grade shop accessories are now more in demand than ever, offering exceptional sales opportunities. Information on request.

Sundstrand Machine Tool Co., 2535 Eleventh St., Rockford, Illinois, U. S. A.

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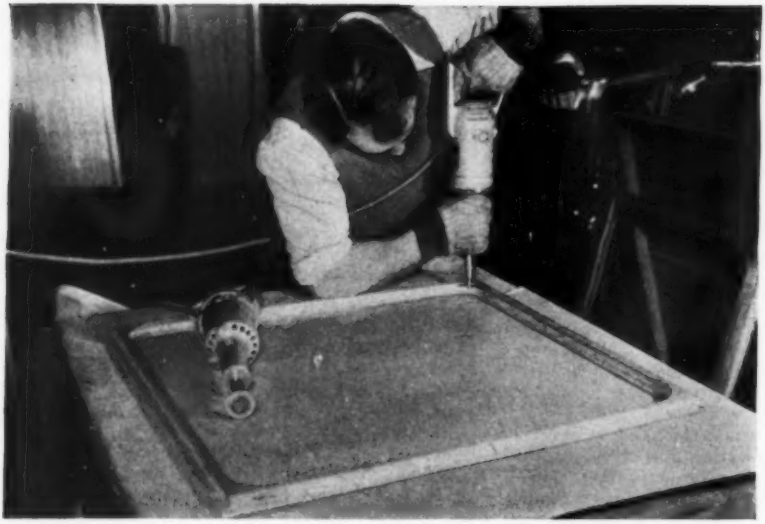
Heavy Duty Portable Tools

By CARLETON CLEVELAND

IN this discussion of heavy duty portable electric tools, it should be explained at the very outset that reference is made to those larger and more powerful tools, as distinguished from the smaller types of hand tools so useful in performing delicate and intricate work. In a recent article on "Portable Electric Surfacing," Fred H. Schell very aptly supports the use of the word "portable" in connection with these tools as "an accurately descriptive word, as the heaviest machines seldom exceed a weight of 40 lbs. The more widely used models average between 10 and 20 lbs.—easy and practical working weights."

As methods and procedures in industry generally have become more specialized, it has been necessary to expand the range and diversity of portable electric tools in their uses along various high-speed production and assembly lines, where they have proved a highly important factor in reducing costs. The portable electric tool—whether a drill, grinder, sander, tapper, screw driver, nut runner, nibbler, saw, or hammer—has indeed become a great aid in economical and

Power screw driver being used on bench grinder assembly line, attaching rubber feet to a die cast zinc alloy base.



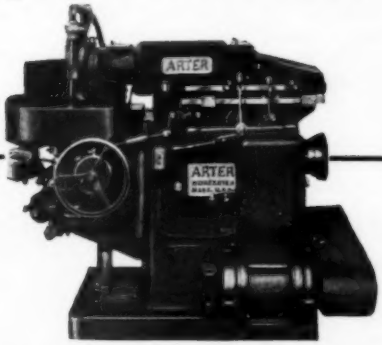
An interesting application of two portable grinders being used in grinding down surface welds on aluminum window frames. By using two grinders, the operator does not have to stop and change wheels for the various radii being ground.

scientific production methods, being equally adaptable on both high-speed production lines and custom built products.

An illustration of the use of these versatile tools on custom built jobs is found in fabrication of present-day streamlined railroad trains. Since these trains vary considerably in design and materials used, with improvements and alterations being continually made (no two railroads having identical trains), they are more or less custom built. Electric drills, screw drivers, and nut runners are invaluable in assembly work of this sort, as for instance, for installing window panels, exterior side flutings, flooring, seats, and other interior fittings. In the maintenance, too, of railroad rolling stock, the portable electric tools find a ready place. Freight cars of all types—box, gondolas, hopper bottom, and flat cars—get rough treatment as they are shunted around in freight yards and on private sidings, necessitating frequent repairs. These are all fussy individual jobs,—replacing missing bolts or nuts; tightening loose screws; replacing sheathing that has been torn off; a broken sliding door track; or some rollers that have been lost. All are repair operations requiring tools that will aid in doing the work quickly so as to keep down the maintenance cost—portable electric tools for boring holes, sawing off parts, grinding or polishing rough spots, setting screws, driving stud bolts, and other jobs that consume so much time when attempted without modern power tools.

In the machine shop, despite the wide range of machine tools, designed to perform almost every conceivable op-

Model-A
Rotary Surface Grinders



To get fine finish on small or large surface areas, Arter Grinders are "tops". Powerful magnetic chucks securely hold square, circular or irregular shapes while they are precision ground. They have a great swing and vertical capacity. Arter accuracy is assured by the one piece casting of the bed, the sturdy wheel slide and knee.

Arter Grinders are built in light and heavy series. Model A-1 machines for tool room or light production work in 8" and 12" sizes. Model A-3 machines for close limit work on volume production in 12" and 16" sizes. For grinding larger diameters, Arter offers Model B machines, hydraulically operated and made in diametrical capacities of 20", 24", 30", 40".

Arter machines mean lasting precision, greater versatility and higher capacity on your production grinding jobs.

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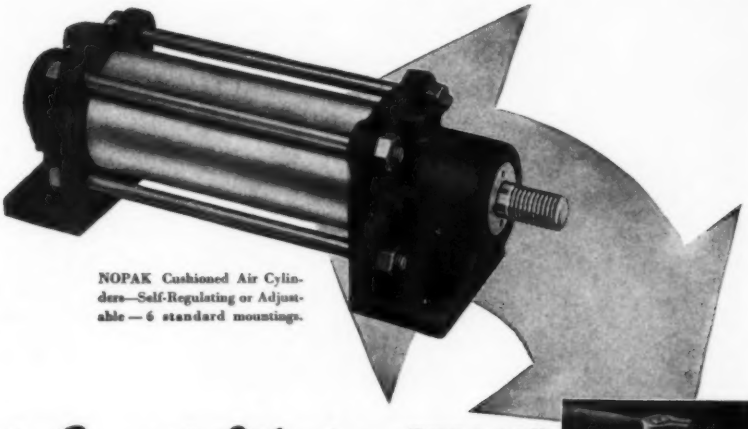
eration, the portable electric tool finds a useful place. Machinists, knowing the cost of drilling holes, for instance, know when and where it is easier and cheaper to take a portable drill to the work than to take a cumbersome piece of work to a stationary machine. Along busy production and assembly lines, one finds whole batteries of portable tools, both electric and air powered, performing a series of operations. Some are suspended in stationary positions with automatic take-up reels used on the power supply cables, while others travel on trolleys. In any of the automobile assembly plants heavy duty portable tools are much in evidence. Here is a man drilling holes in radiator grilles; over there is a chap tightening cylinder head bolts almost as fast as they can be counted; two men, one on each side of the frame guide powerful tools in bolting the engine into place; and down there in the pit under the assembly line a worker uses a portable tool in asembling brake connections. On the rear axle assembly line, high frequency type portable power tools are used in bolting rear axle tubes to gear housings, nut setting, and other operations. High frequency tools are also used on drive shaft assembly.

Portable power tools are also used in motor assembly work, frame assembly, tightening clutch pedals and installing seat assemblies, while operators with whirring buffer - wheels put final polishing touches on bodies and fenders before the assembled cars roll off the line.

More and more have methods and procedures in industry become specialized, and it therefore has become necessary for the portable electric tool

Cleaning castings with portable grinder equipped with wire brush.



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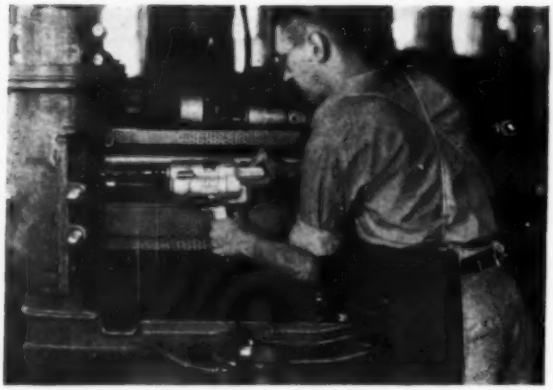

Cleaning-up holes on a large lathe.

to follow in this wake, until, as one executive has recently said, "the portable electric tool industry finds itself a specialist in every sense of the word." An outstanding example of this specialization is the high frequency or "high cycle" tool, so popular with many users in industry. Although originally developed to meet special demands, these tools are now standard equipment. Operating on a frequency of 180 cycles, they offer certain definite advantages that are extremely important to large users who must depend upon their tools for uninterrupted production. Relative to speed and power, the motors in these high frequency tools are of induction type, operating speed being governed by the frequency of the current. In the customary 60-cycle induction motors having two poles, the average speed is 3,600 r. p. m., while high frequency motors operating at 180 cycles also with two poles, have an average rotor speed of 10,800 r. p. m. The motor slows down only slightly at rated load. This maintenance of speed and power under load results in a more capable tool, faster work, and more accurate coordination of production schedules, with more uniform results throughout the day and less operator fatigue.

There is of course some expense involved in switching to the use of high frequency or "high cycle" tools, since it is necessary to install equipment for generating 180 cycle current. Large users, however, find this cost more than offset by the advantages accruing from

Using portable grinder in refinishing of worn spots on a large automobile body die.

Cut "Cut-off" Costs

with this NEW Delta Abrasive Cut-Off Machine

This new, powerful, accurate abrasive Cut-Off Machine can be used everywhere, in large shops or small, where materials have to be cut to accurate length on a production basis. It can be used for hundreds of operations now performed by costlier machines—or being done by hand at high cost. It actually creates jobs for itself—saves time and money wherever used.

Cuts Practically Any Material

It will cut speedily and accurately to exact lengths such materials as steel, cast iron, monel metal, bakelite and all plastic materials, pipe, wire, rope, stellite, tool steel, manganese steel, fibrous material, title, brick, carbon, porcelain, slate, hard rubber, concrete coping and sand cores. On metal it leaves the cut with a polished surface. (Note: A Delta Cut-Off Machine with special blade is also available for cutting non-ferrous metals).

STEEL of all kinds and shapes, such as angles, hollow squares, channels, etc., is accurately and quickly cut—at any desired angle.

MANY NEW FEATURES

This improved Abrasive Cut-Off Machine is ruggedly constructed—wide spaced Timken roller pivot bearings and double arbor sealed-for-life bearings requiring no lubrication—powerful Texrope V-Belt drive—adjustable fence—accurately machined table. Is perfectly balanced—cuts material at any angle and embodies unusual safety features. Can be used with abrasive wheels or cross-cut blade for wood. Capacity up to 2 inches diameter, or material up to 2 inches by 6 inches.

TOOL STEEL when it must be cut to exact lengths as here illustrated, is easily handled on this new tool.

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the use of tools of this type for continuous heavy duty service. There is no question but that the "high cycle" tool has made a very definite and important contribution to the leading position which this country holds in mass production efficiency.

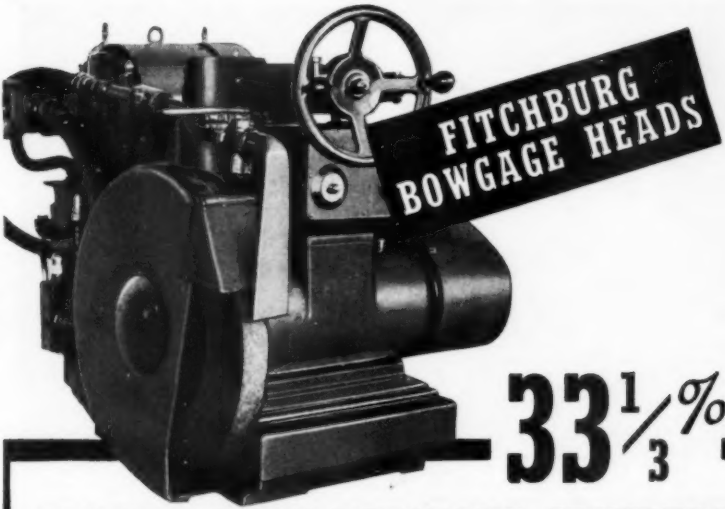
Since there is no electrical connection between stator and rotor in the induction motors used in "high cycle" tools, there is at once eliminated a most frequent cause of service trouble and maintenance costs, since there are no commutators and brushes to wear or require replacement. The solid copper bar construction of the rotor eliminates wire windings and soldered joints. This construction feature also tends to reduce motor failures and maintenance costs, since there are no loose or revolving wires subject to the stresses and strains of centrifugal action. One important company in a mid-western city reports having been able to save some $400 a month on maintenance costs through the installation of high frequency tools.

There are other, special, units of this heavy duty portable tool group that

Cutting 16-gauge sheet steel with portable electric shear.

are finding an ever-widening range of usefulness. In modernizing, construction, and maintenance work the power hammer and saw are indispensable. The power hammer, delivering close to 3000 blows a minute, may be used with any one of a number of available hammer tools designed to handle hundreds of applications. There are

Drilling screw holes in refrigeration coil assembly.



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FASTER THAN PREVIOUS GRINDERS

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You too can save time and money by replacing conventional type grinding wheelheads with standard Fitchburg Bowgage units. They fit your present bases, or they can be adapted, on special mounts, for automatic multiple grinding of precision work in mass production. Easy to remount for other jobs, rapid and simple in operation, they use a new application of familiar mechanical principles to increase accuracy of feed control.

YOU TOO CAN SAVE ON GRINDING COSTS

Write today on business letterhead for new booklet, free to executives, "Fitchburg Multiple Precision Grinding."

FITCHBURG GRINDING MACHINE CORP.

1807 FALULAH ROAD, FITCHBURG, MASSACHUSETTS, U. S. A.

Power screw driver being used in assembling seat adjustment mechanism. (Courtesy, Fisher Body Co.).

Using a star drill in electric hammer for making holes in a concrete wall.

speed bits and star drills; cold, scaling, and flat wood chisels; bull points and feed bars; as well as web cutting, four point scaling, beading, bushing, and seam tools. Tool blanks, heat treated on the shank end only, are also obtainable, enabling users to forge a work end to suit their own requirements. These hammers, with suitable tools, are used for chipping and chiseling in steel; drilling or channeling in concrete, stone, or brick; removing form marks in concrete surfaces; caulking joints and seams in tanks and pipe lines; and removing scale from boilers and tanks. They are also used for drilling holes in concrete for the installation of theatre seats, electric signs, fixtures and awning hangings; and for tamping molds and concrete forms and vibrating concrete forms.

When one thinks of a saw, it is generally in connection with some phase of woodworking or building con-

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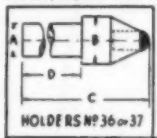
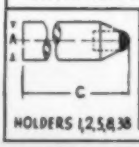
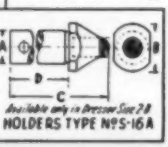


Holder	A	B	C	D
1	1/16		1 5/16	
2	1/16		1 5/16	
5	1/16		1	
8	1/16		1 1/16	
36	1/16	5/16	2 1/16	1 5/16
37	1/16	5/16	2 1/16	1 5/16
38	1/16		3 1/16	
S-16-A	1/16	5/16	1 3/16	11/16





CARBOLOY *Diamond Impregnated* WHEEL DRESSERS

struction. The electric power saw, however, aside from its wide use by carpenters and builders, or in wood working plants, railroad car repair work, packing case manufacture, in freight packing and crating work, and in shipping rooms, has proved itself extremely useful (with saw blades replaced by abrasive discs) in the cutting of marble, asbestos, transite, tile, brick, porcelain, slate, glass, carbon, hard rubber, plastics, and metals such as hardened tool steel. In the iron and steel foundry, for instance, the abrasive wheel in a portable saw machine may be used on tough jobs of cutting risers and gates from castings. In the tool room, the abrasive cut-off wheel may be used for cutting tool steel to approximate length and shape and cutting back ends of tools where the edges have been broken or chipped. A special steel saw blade also may be had for cutting soft, light gauge non-ferrous metals.

Finish grinding on a die with a high speed die grinder.

Portable electric tools probably receive more rough treatment, with less attention to their maintenance, than any other type of power machine. They

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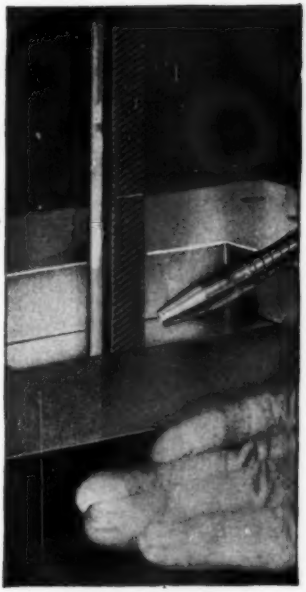

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are wide open to abuse because they are so extremely portable and handy, and are used by different workers about the plant for every imaginable job and under every conceivable condition. In both large and small shops, portable units are likely to be used by more than one person, while with power machines of the larger stationary type, it is generally the responsibility of some particular individual to use the machine and see that it is maintained in proper operating condition. A specific responsibility like this rarely applies to a portable tool. Here the ability to absorb punishment and keep "pitching" is commonly taken for granted, until something goes wrong and "the thing don't work."

Grinding down a rough casting with a portable electric tool.

The fact that a portable power tool fails to operate is not necessarily an indication that the fault is in the tool. The supply line may be dead or connections may be faulty. An inspection

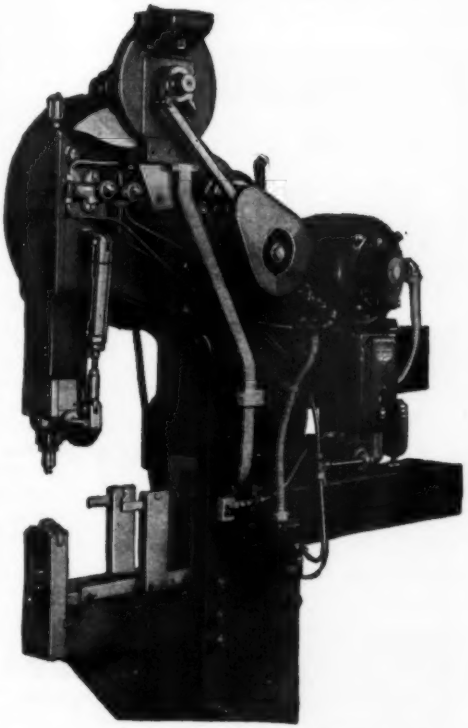
pierces and rivets

AUTOMATIC FEED "RIVET - PIERCE" RIVITOR

(the new "RK" machine)

The previously unpierced work is driven down over the underfed rivet —punching a slug out of the work. The rivet is then set at the next stroke of the machine.

Handles solid steel rivets (unannealed) of sizes up to .140 dia. x ¼" long. These may be of any flat head type such as "coopers" or "tinners". The size mentioned above can be set in total maximum work thickness of .075.



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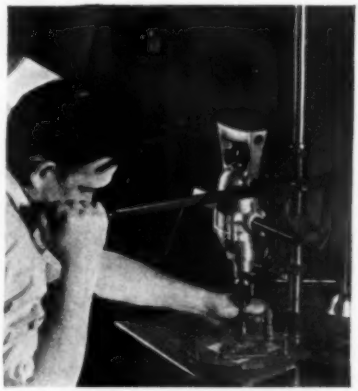
of the tool may reveal that an accumulation of dust and dirt may have lodged between the brushes and commutator, breaking the circuit. Brushes should be inspected frequently and kept free from dust, and worn brushes should be replaced immediately. All abrasive tools, such as sanders, surfacers, polishers, grinders, and in some instances power saws, are subjected to abnormal quanities of abrasive grinding dust, and dirt, and should be inspected and cleaned at least once a week, or more frequently if the dust condition is severe. Accumulations of abrasive dust generally can be removed by blowing out with compressed air.



Using a bench stand to convert a portable unit into a drill press for precision work.

As a part of the program of periodic inspection, tools should be properly lubricated. Such as are used constantly on production or heavy duty work will require frequent lubrication to maintain them in efficient working order. Electric hammers and saws require special lubricants. It is always best to flush old grease from gear cases, gears, and bearings with gasoline or kerosene before refilling with fresh lu-

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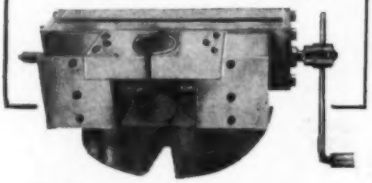

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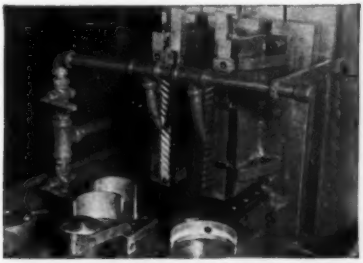

The special AMERICAN broaching machine shown to the right is arranged to broach the joint face of steel back babbitted bearings removing a maximum of .010, and finishing to an accuracy of .0003.

Photograph shows operator with machine in position to start broaching stroke. The parts to be broached are loaded into the work nest on the work table shown in the upper right photograph.

This machine is a low tonnage, short stroke speed unit designed to maintain the extremely close tolerances necessary. Production of over 500 pieces an hour is obtainable.

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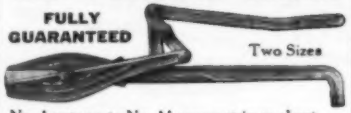

Two Sizes

No. 1 cuts up to No. 11 gauge strip or sheet.
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Special Blades for shearing stainless steel.

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bricants. There are probably few users of these tools who appreciate the precision required in the manufacture and assembly of good portable electric tools. They must be compact and light for easy handling. The high speeds demand well insulated armatures that are balanced both statically and dynamically. The service also demands extremely close tolerances on all spindles, bushings, housings, etc., for almost perfect accuracy of size, alignment, concentricity, and roundness. Some parts are held to .0002". Therefore it can be seen that despite heavy-duty efficiency and ability to stand up well under harsh treatment, the portable power tool is nevertheless a piece of delicate mechanism rightfully demanding respectful consideration if its life of usefulness is to be prolonged to the fullest extent.

EDITOR'S NOTE—We appreciate the timely and helpful suggestions and photographs loaned for illustrative purposes by the following manufacturers:—Albertson Mfg. Co., Sioux City, Ia.; Blackhawk Mfg. Co., Milwaukee; Black & Decker Mfg. Co., Towson, Md.; Chicago Wheel & Mfg. Co., Chicago; Cincinnati Electrical Tool Co., Cincinnati; Chicago Pneumatic Tool Co., New York; Dumore Co., Racine, Wis.; Duro Metal Products Co., Chicago; Gaston Power Tools Co., Evergreen Park, Ill.; Hisey-Wolf Co., Cincinnati; Independent Pneumatic Tool Co., Chicago; Madison-Kipp Corp., Madison, Wis.; Mall Tool Co., Chicago; Milwaukee Electrical Tool Corp., Milwaukee; Rotor Tool Co., Cleveland; Skilsaw, Inc., Chicago; Speedway Mfg. Co., Cicero, Ill.; Syntron Co., Homer City, Pa.; Standard Electrical Tool Co., Cincinnati; Stanley Works, New Britain, Conn.; U. S. Electrical Tool Co., Cincinnati; Van Dorn Portable Tools, Towson, Md.

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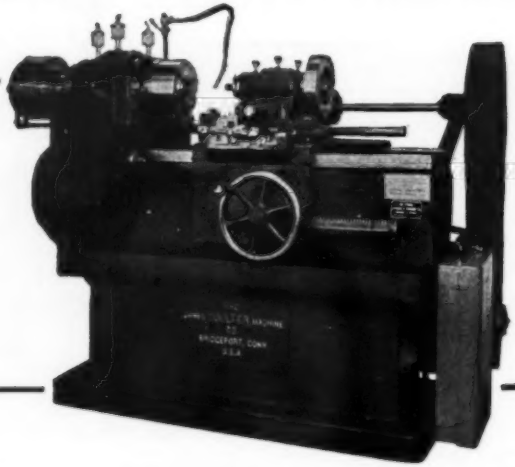

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Modern Oiling Devices

By F. C. KOVARIK

IT is only natural that the designer of a machine tool should give primary attention to its mechanical function. He must "keep his eye on the ball" to make sure that his machine performs its work in the most satisfactory manner possible.

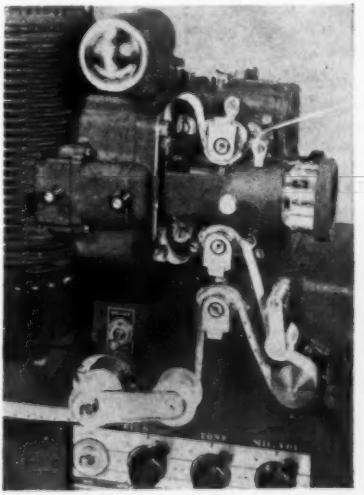
But while his eye is on the ball, we who are specially concerned with lubrication keep our eyes on the bearings . . . for in the final analysis, it is the life of the bearings that ultimately determines the service life of the machine. Too often, provision for lubrication comes as an afterthought instead of being incorporated fundamentally in the machine design.

Adequate lubrication not only requires the proper selection of lubricants, but equally careful selection of devices which will deliver those lubricants in the correct quantities, with the necessary frequency. In other words, oil of the right specification must be delivered at the right time and place to maintain a constant antifriction film if bearing wear is to be held to a minimum.

Today there are lubricating devices available for every requirement, developed by an industry that has kept pace with the needs of machine tool progress. A brief examination of the principal types may help to determine which oiler may be the most practical to assure suitable lubrication of your equipment in the hands of users.

The Simple Oil Cup

Simplest and least expensive of lubricating devices is the oil hole cover or oil cup, fashioned from brass or steel and inserted in a drilled or tapped hole that leads to the bearing. Oil poured into such a cup flows directly to the bearing, flushing and lubricating it in a single manual operation. Where oil-



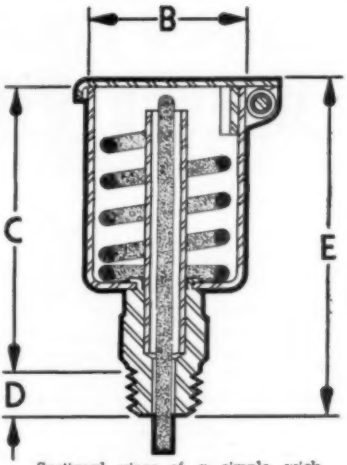
Continuity of operation and long life of parts is assured on motion picture projection equipment by numerous oil cups.

ing is not required too frequently, where excess oil can do no damage, and where mechanics can be depended on to lubricate regularly, these simple oil cups are entirely satisfactory—and there are literally millions of them in use.

Care should be taken however to select an oil cup that is durably made to withstand hard knocks and abuse; one that is well covered to prevent dust and dirt from accumulating and from being carried into the bearing; and above all, select an oiler with a generous oil passage that will permit the free flow of oil to the bearings.

Oil cups and oil hole covers are manufactured in a seemingly endless variety of sizes and shapes—threaded for screw insertion or smooth-shanked for drive in — vertical types, elbow types, and angle cups for use where it is inconvenient to drill the oil hole either vertically or horizontally—male threaded for direct applications, and female threaded for use with nipples or pipe extensions to reach distant bearings.

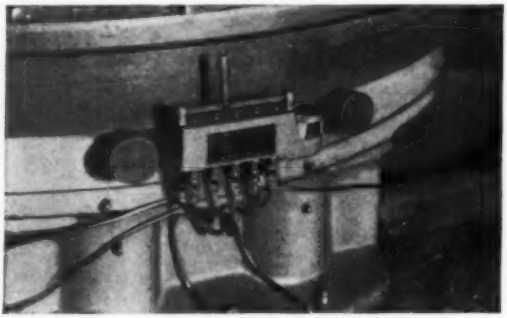
Most oilers have a self-closing spring-hinged cover; but lift top, button top, ball valve and revolving sleeve closures are also provided. In the presence of excessive dust, special gasketed dust-proof covers are available; and for use where fumes are present which might be absorbed to the deterioration of the oil, vapor-tight moisture-proof screw cap oilers are also available. Provision has been made for every possible contingency.



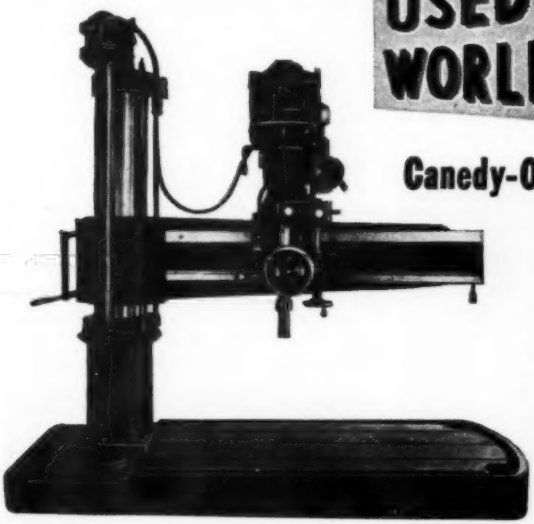
Sectional view of a simple wick oiler. Serving as a filter, the wick prevents particles of dust and sediment from being carried by the oil into the bearing.

Tube Oilers

For reaching bearings difficult of access, or so located that they might be inadvertently overlooked, tube oilers are used which have a conveniently located fill opening, and a tube that carries the oil (by gravity) around ob-



An example of multiple sight gravity oiling in which lubricant is conveyed by tubes from a central reservoir to strategic bearing points, supplying each with the quantity of oil needed.



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Length of arm	3'	4'	5'
Greatest distance from spindle to base	43½"	48"	48"
Minimum distance from spindle to base	8½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	8½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	89"	98"	98"
Working Surface of Base	29"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

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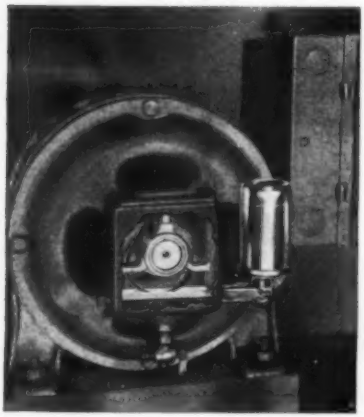
structions and into bearings in locations otherwise inaccessible. Tube oilers are usually made to order to meet specific requirements, and may be fabricated in an infinite variety of sizes and shapes....with flared opening or spring-hinged covers....with threaded or drive shanks, or with special die cast drive-in or threaded bushings.

Wick Oiling

The wick feeding of oil is as old as the oldest oil lamps—dating back to the



Constant level oiler which takes care of motor bearing requirements. Unbreakable oil cups are almost mandatory in food processing plants.

time when tufts of moss served to keep alight the tiny flames that dispelled the gloom of prehistoric caverns. But it is only in comparatively recent years that this ancient wicking principle has been converted to the needs of a machine age civilization, and the tip of a wick adapted to moistening the surface of a rotating shaft.

For lubrication purposes, most wicks are made of wool felt, wool yarn, or cotton—the latter being either woven or wire-cored. These wicks have high capillarity and are readily cleaned.

Wick oiling has many important advantages in lubrication. It not only supplies oil as needed but the wick serves as a filter to prevent particles of dust and sediment from being carried by the oil into the bearing. Long after the reservoir supply of oil is exhausted, the saturated wick continues to moisten the bearing.

The high efficiency of wick feed oiling is based on the capillary action of the wick itself, which transfers oil from cup to shaft at a rate that corresponds to actual lubrication needs. As the bearing surface of the shaft passes over and in light contact with the wick it draws off a light film of oil which is replaced in the wick from a reservoir, to the extent that the wick again becomes fully saturated.

On this principle it is possible for the oil reservoir to be above or beside the bearing, or even below it. Under-

Here is a constant level oiler of the vertical type installed on a blower.

feed wick oilers are in common use—the electric fan is an example.

Over-the-shaft wick oilers usually employ an extra integral length of wicking so that the saturation may be drained away gradually by gravity, causing droplets of oil to detach and

MORE and more tool rooms and die shops are taking advantage of Duro Hand Grinders to speed up production. These grinders have surplus power, the Heavy Duty Grinder a 40 watt output, the Streamline Grinder a 17 watt output. Both Grinders turn 24000 R.P.M., enabling work to be turned out faster, better and cleaner. They are designed and built to give long trouble-free performance. They have power — speed — precision — compactness—balance and streamline design—everything needed to improve tool maker's work and save much valuable time. You can get immediate delivery in any quantity. Send for literature today.

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In this application the oiler serves an abrasive cut-off machine.

drain into the bearing at regular intervals. In this manner, wick oiling can give continuous lubrication without the wick coming in actual contact with the shaft.

Variations in temperature and viscosity are the principle factors affecting the rate of oil feed from a wick type oiler, although other operating conditions may have some effect. Low temperatures and heavy oils tend to retard the flow; whereas the oil flows more readily at higher temperatures and in the case of lighter bodied oils. Careful selection of the type, grade and viscosity of the lubricant, together with due consideration of prevailing temperatures where it is used, permit adaptation of the flow rate to supply just the amount of lubricant needed for any particular bearing.

Constant Level Oiling

The use of constant level oiling is a fine principle by which to eliminate the waste of liquid lubricants—the modern media which separate and reduce the friction between machine bearing surfaces having high differential speeds. It operates on the principle of an unchanging oil level into which the bail or roller bearing dips at each revolution. Shafts are oiled by a ring suspended over the shaft, which dips into the oil well and carries up a continuous supply of lubricant as the shaft rotates.

Constant level oiling may be applied generally to horizontal bearings on stationary machinery where a suitable well can be provided. It is not recommmended for locations where moments of vibration or rapidly moving parts cause extreme agitation or continuous pumping action.

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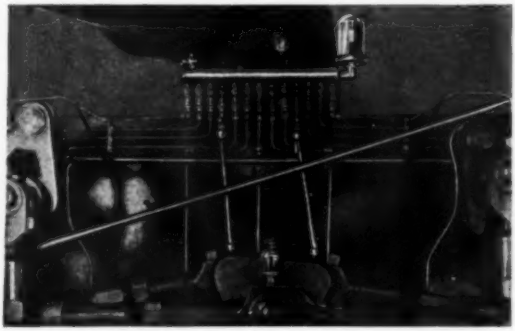

A sight feed gravity oiling system distributes lubrication to important bearings on this large engine, handling from 2 to 24 or more strategic points.

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stant level oilers. As each bearing uses oil, there is a reservoir constantly at hand with a fresh and adequate supply, a reservoir of glass or transparent plastic which shows at a glance that the reserve supply is ample. Below this reservoir is a hollow stem which projects down to the desired level of the well—permitting air to enter and oil to drain from the reservoir only when oil consumption causes the supply in the well to fall below the desired level.

Either of two types of reservoirs is commonly used for constant level oiling—hinged reservoirs which are used advantageously to prevent their being taken away; or bayonet type reservoirs that allow the use of pre-filled bottles, and may be made in wider surge ranges.

Several different types of oilers are shown in this power plant view. Note the unbreakable transparent bodies.

Unbreakable Plastic Supplants Glass

Probably 80% or more of the oilers made with transparent reservoirs are now supplied with bottles of unbreakable plastic. The widespread use of such oilers is practically mandatory in such industries as food processing where the danger of broken glass constitutes such a hazard that the mere suspicion of particles of glass in the food, demands that entire batches be discarded with commensurate loss.

In other applications of transparent oilers, the advantages of unbreakable plastic have generally been so obvious that plastics are substituted for glass—the only exception being in applications where temperatures range above 150° F., at which many of the transparent plastics now available tend to soften and become unfit for service. Care should be taken in the selection of plastic oil containers to make sure they are not of a type that becomes brittle with age, in which case cracking is sometimes experienced. Suitable plastics have made an enviable record in use for lubricating devices—making it possible to have a visible oil supply in many applications where previously, the extent or hazards of breakage prevented the use of glass.

Sight Gravity Oiling

Sight gravity feed oilers have their

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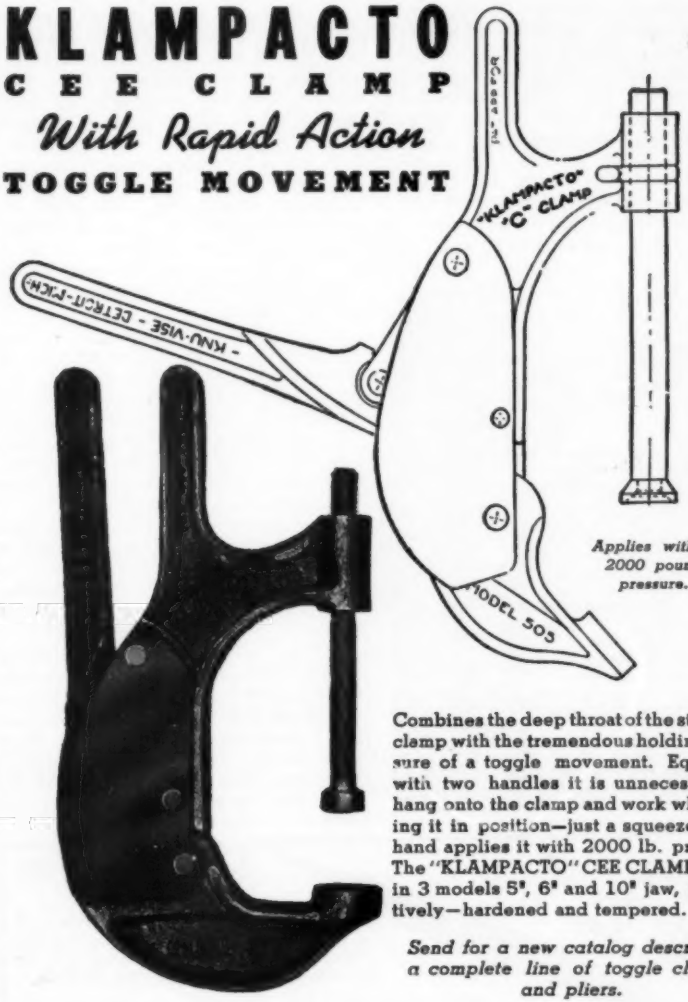

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most common application in those locations where the flow rate of the lubricant must be rigidly controlled. Through use of a needle valve, the drip of oil may be accurately regulated anywhere from 10 drops a minute to a complete closure. The dripping oil is instantly visible through a glass window in the oiler shank, and may be examined whenever it is desired to re-regulate the flow rate or to make sure the oiler is operating properly.

A shut-off valve, which permits cutting off the oil flow when machines are idle, does not interfere with the regulating adjustment—so that when work is resumed, re-opening the valve permits oil to drip at the same rate as before.

It might be mentioned at this point that wick feed oilers with transparent reservoirs, sight drip windows and manual shut-offs are also available.... used frequently where the rate of oil flow can be constant, and need not be adjusted precisely.

Multiple Oiling

No discussion of lubricating devices would be complete without mention of the many applications of intricate and high speed machines, where the use of multiple oilers is not only a convenience and economy, but a protection against excessive wear due to the oversight of some obscure or inaccessible bearing.

From a single reservoir placed conveniently above the bearings which it serves, oil can be supplied to from 2 to 24 locations simultaneously, furnishing each with the quantity of lubricant required.

Multiple oilers range from the simple oil tank with sight drip fittings, through right gravity feed and wick feed types to the overflow tube types which drain off a predetermined quantity of oil to each bearing every time the oiler is actuated. The actuation may be by hand lever or plunger, by a Telechron

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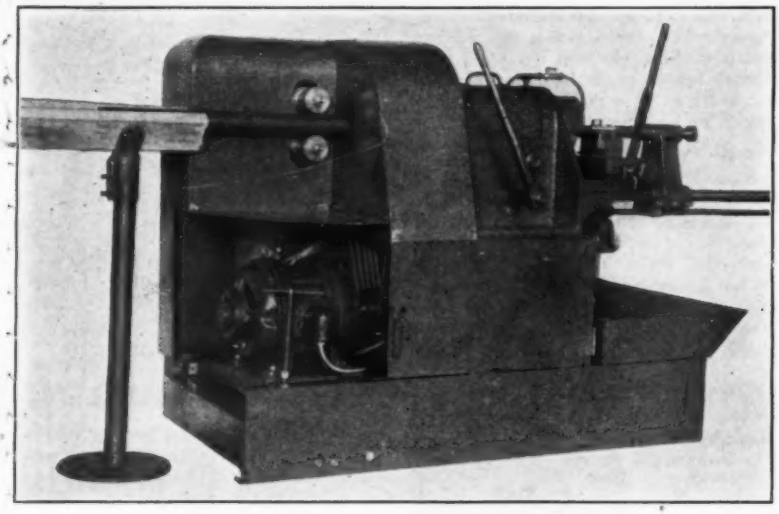

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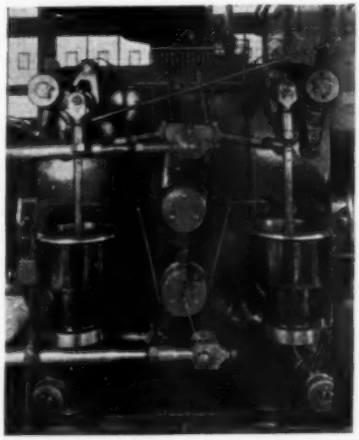
timer, or by machine-driven mechanical levers that actuate the oiler once for each 100, 200, 300, 400, 500 or 600 strokes of the machine which is being lubricated.

All multiple oilers of the gravity or wick feed types should be equipped with shut-offs so that lubricant is not wasted when machines are idle. Many multiple oilers are also equipped with manual means of flushing and pre-oiling bearings of a machine about to be placed in operation.

Special Oiling Devices

Special oiling devices are available for special needs. For example, there is a vibrating rod oiler actuated by the vibration of a rotating shaft; a wick feed oiler for use in feeding oil into pneumatic machines, air motors, pumps and the cylinders of air-operated chucks; and special slow feed wick oilers that may be used on motion picture projectors, portable sewing machines and similar equipment where excesses of oil must be avoided and spilling must be prevented during transportation.



With the number and variety of lubricating devices now available to machine tool designers, and the specialized lubrication engineering service now available through reputable manufacturers of these devices, there is no reason why any machine need ever go into service without adequate provision for efficient lubrication to prolong its useful life.

(Illustrations—Courtesy Gits Brothers Mfg. Co., Chicago.)

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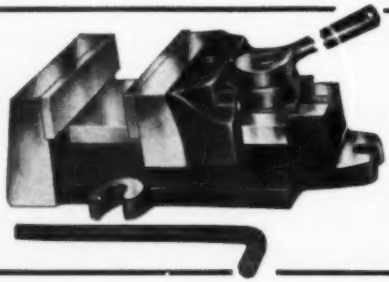

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Equipping a Plant Weldery

By FRANCIS A. WESTBROOK, M. E.

SINCE welding is being used, more and more, as an instrument for production or maintenance, or both, numerous industrial concerns around the country are installing, or have already installed, plant welderies. In other words, they have developed departments where this work may be carried on with a maximum of efficiency, by operators who have the skill and conveniences necessary to do dependable and economical work. Of course, the equipment and layout of a plant weldery will depend, to a great extent, on the type of industry. In order to provide a comprehensive discussion where the requirements are exacting, a plant manufacturing steel products has been selected. Modifications appropriate for other types of plants will doubtless be readily apparent. Many of the requirements are general in character and apply to almost any weldery, while others will vary according to the type of work.

Fig. 1 — Absence of rigid frames of any sort around welding booths or across their tops makes it easier to move equipment into or out of the enclosures, particularly by overhead cranes. Ventilating system operates on principle of moving low volume of air at high velocity and holds to a minimum the fumes incident to welding operations. (Photo—Courtesy Reliance Electric & Engineering Co., Cleveland.)

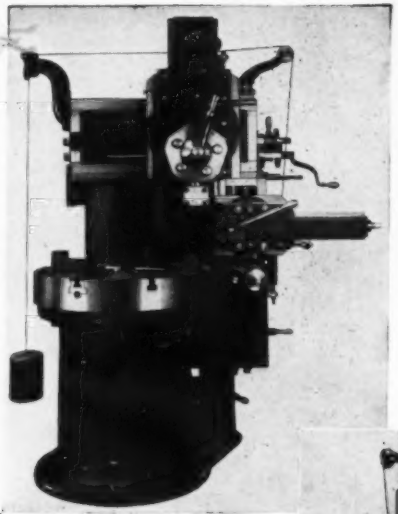
Fig. 2—A 5" flexible tubing, individually counterweighted with light airplane cable, and equipped with screened bell end, can be moved directly over welder's work. High velocity of air picks up fumes from welding operations which would otherwise escape into the air which the welder must breathe. (Photo—Courtesy Reliance Electric & Engineering Co., Cleveland.)

Among the general requirements are such obvious ones as that the weldery should be located in a room with plenty of light and ventilation, and should have enough floor space to permit of handling the work with safety and dispatch. Of course, location of the weldery is important in order that transportation of materials and work may be held to a minimum. Suitable overhead traveling crane service is also necessary for easy movement of the work, the ratings of the cranes naturally depending on the size and weight of work to be handled.

The doors for this department must, of course, provide openings of sufficient height and width to permit industrial tractors or other vehicles to bring in the work and take it away. The lighting should also receive careful consideration, especially for the booths devoted to welding operations. An important detail here is that the lights should not be placed so as to cause reflections on the backs of the masks used by the welders. Partitions for the arc welding booths should, in many cases, be made of a flexible material suspended from wires so that they may be moved out of the way during placing of large work on the benches. A good material is a heavy canvas painted black with a fireproof paint. Asbestos is also very good. Walls and ceilings should also be painted black to prevent reflections from the arc on the backs of hand shields or mask. Practically all of the foregoing requirements will apply to almost all welderies, in one form or another.

We will now consider the equipment installed in the weldery of a plant in the steel industry where the machinery and operations are heavy. The equipment is as follows:—one d.c. portable arc welder of from 50 to 200 amp. capacity, and one d.c. portable machine of from 300 to 400 amp. capacity. Also one a.c arc welder of 150 amp. capacity.

Fig. 3 — Drop hammer die with broken shank, repaired by welding and ready to be machined.



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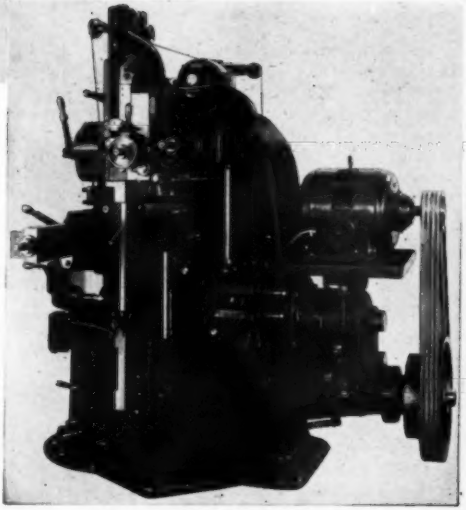

(Rear View)

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Fig. 4—Cast iron frame of large punch press repaired by welding. Such repairs often save both time and money.

The a. c. welder is small enough to be moved to any part of the plant for light jobs. This has been found to be a very convenient and economical unit, especially as the man who does the welding can handle it. The larger welding machines are, of course, also taken to the work when it is the economical thing to do, but there are numerous uses for the small one which make it well worthwhile to have available.

There is also an acetylene generating unit installed, according to Fire Underwriters' regulations, to supply one welding and two cutting stations located at convenient points in the weldery.

Other equipment in the weldery consists of a power hack saw to cut off angles, etc., a medium sized set of rolls for rolling sheet, a plate shear heavy enough to cut $\frac{3}{8}$" plate 4 ft. wide, a power brake for handling $\frac{1}{8}$" steel sheet, and a drill press for drilling holes which it is not desirable to burn.

When special work is called for, such as machine frames, cabinets, machine parts, welding jigs, etc., the designs are made by the Engineering Department in cooperation with the weldery foreman, who is in a position to give valuable assistance as to economical methods and so forth. When the design is completed it is approved by the superintendent before being sent to the weldery. When the designs are received, the foreman of the latter checks them for material and places an order for his needs.

Fig. 5—Board hammer ram with corner repaired by welding, after machining and ready for service. Repair was made in upper right corner.

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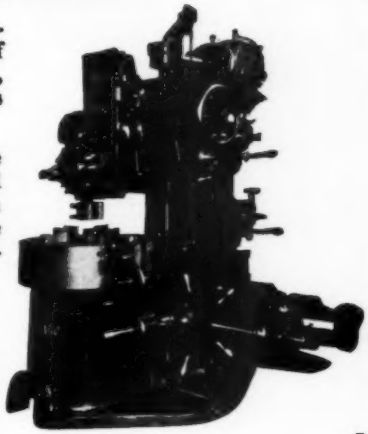

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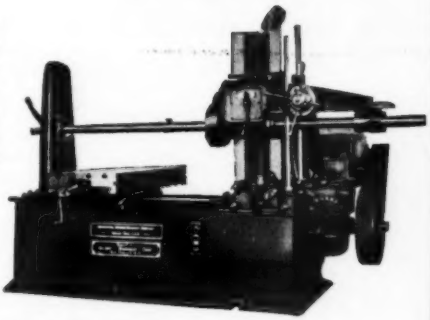

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Where the fabrication of tanks or other large items is involved, the foreman makes an estimate of the labor and material cost for approval of the superintendent before starting work. Accurate cost records are kept of every job passing through the weldery, on shop orders in charge of the record clerk, who turns the cost in to the Cost Department when the job is completed.

With very few exceptions, welders are selected from among promising men in the organization and trained by the weldery foreman or under his supervision. The man who is to be trained as a welder is first placed on floor work in the weldery. When he has become proficient in preparing work for the welders, he is given instruction in actual welding, progressively, until he is able to do any of the different classes of work coming in to the Welding Department.

All work, as it comes in, is laid out by the foreman or his assistant, and when it is completed it is inspected by the foreman personally before it goes out.

The work done in the weldery is varied and has had very beneficial results. For instance, the building of safety guards has been improved and cheapened by the use of arc welding, whereas formerly this work was all bolted and riveted. Fabrication by means of welding takes considerably less time than laying out bolt and rivet holes and the job is more satisfactory as it is permanently rigid. In the repairing of broken castings, new parts are frequently made of welded construction, which often costs less than a pattern for a new casting.

Other types of work done in the weldery include such items as the repair of a 3200 lb. cast iron flywheel on a trimming machine by making arc welds on top of the casting, using studs;

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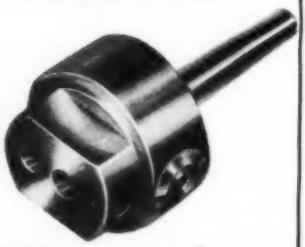

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welding a broken shank on a drop hammer die (Fig. 3); welding cast iron punch press frames (Fig. 4); etc.

A particularly interesting repair job was performed on a board hammer ram. It is a steel forging weighing some 1600 lbs. and costing $800.00 when new. The upper right hand section, Fig. 5, was broken off and was replaced by arc welding at a cost of only $26.00 for labor and electrodes.

The procedure for making the weld was to cut off the corner of the ram with an acetylene torch to a point half way in the slot followed by thorough chipping and cleaning. This removed the strain from the heat treated ram, resulting from the heat of the cutting operation and made a more satisfactory weld possible.

As rams generally have been heat treated, care must be exercised in the amount of heat used in making the welds. If the piece has been in a cold room or outdoors in winter a slow, penetrating heat must be placed upon it until the frost has been removed. Welding should not be started until the temperature has been raised to about 100° F.

The welding rod used for such work should have as nearly as possible the same carbon content as the forging. The welding should be applied in layers or strata which are all in the same direction and parallel, care being taken to have them thoroughly fused with each other. The beads in the second layer should be at right angles with those in the first layer, and this right angled arrangement should be followed in applying to successive layers. Beads should not be laid down while the last ones are still red. They are not peened. The average life of these welds is 24 months, with continuous use every day.

Two of the illustrations show canvas welding enclosures at the Reliance Electric & Engineering Co. plant. The

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only rigid part of the enclosures is the plant wall against which all the booths are located. Three sides of each booth make use of regular brown welding canvas, hung by corners from standard safety zone stanchions, 6'2" in height, with a base 125 pounds in weight. Each stanchion has bolted to it a light sheet steel strip which projects approximately 12" on either side of the upright to prevent injurious light rays from passing through curtain junctions. The stanchions used at corners of the booths have two of these light sheet steel strips bolted at right angles to each other to form tight corners. Eyelets in top corners of each section permit fastening the canvas securely to hooks in stanchion tops. This method of holding enclosures in place is important because it eliminates wires or pipe supports across tops of the booths, permitting greater freedom and safety in depositing work from overhead cranes. Making the canvas its own means of suspension leaves nothing solid to run into or tip over in bringing work into or out of a booth.

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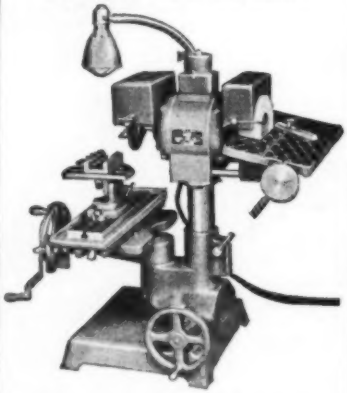

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The canvas is of standardized size (10-ft. in width by 5 ft. in height) to facilitate interchange with other departments where similar enclosures are used around engine lathes as protection against flying chips, around spot welding operations to guard against flying sparks, and around other work to corral flying nails, metal particles, etc., that might endanger passers-by.

Ordinarily, welding booths at Reliance are kept to 10 by 10 feet in size. This area has been found large enough for handling regular work. However, should the size of work necessitate, spare curtains and stanchions are put up to make the booth enclosure 10 by 20 feet, or larger in any desired combination of 10-foot additions. All of the interior of a booth is made available as working space; bulk supplies are kept outside booths to decrease the hazard of an operator's bumping into or stumbling over them inside.

A second improvement concerns the method of ventilation. Basis of the system involves the use of a low volume of air at a fairly high velocity—545 cu. ft. of air per minute per intake at approximately 4" static pressure. A 15-ft. length of flexible tubing, 5" in diameter, and individually counterweighted with light airplane cable, is dropped into each booth from an over-

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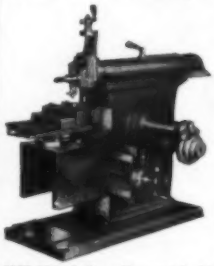

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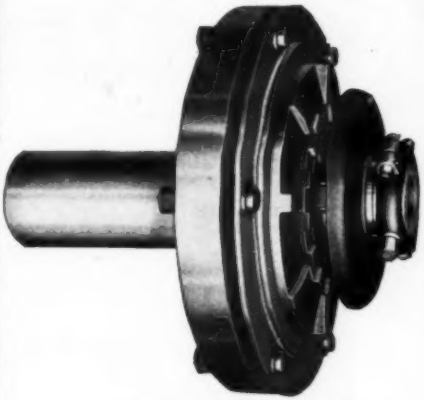
"Labor in the Defense Crisis"

Experience in democratic countries abroad shows that efforts to prohibit strikes by law or impose compulsory arbitration are likely to boomerang and increase rather than curtail the number of industrial disputes.

This rather unexpected finding is contained in a pamphlet, "Labor in the Defense Crisis," by T. R. Carskadon, published by the Public Affairs Committee, 30 Rockefeller Plaza, New York. The pamphlet summarizes a survey of defense labor problems made by a committee of The Twentieth Century Fund.

It is pointed out that the Wagner Act offers a peaceful alternative to strikes by providing for appeal to the National Labor Relations Board. For matters which cannot be carried before the N.L.R.B. the question is:—"Shall we attempt to achieve industrial peace by force or by voluntary agreement?"

"There are very strong forces in the country," the pamphlet admits, "favoring the prohibition of strikes in defense industries." After reviewing the failure of laws banning strikes and compelling arbitration in Australia, Canada, and Great Britain. the pamphlet declares that "the evidence shows pretty conclusively that compulsory arbitration, however simple it may sound in theory, cannot be enforced in actual practice." During World War I in Britain, for example, 1,500,000 munitions workers took part in illegal strikes.



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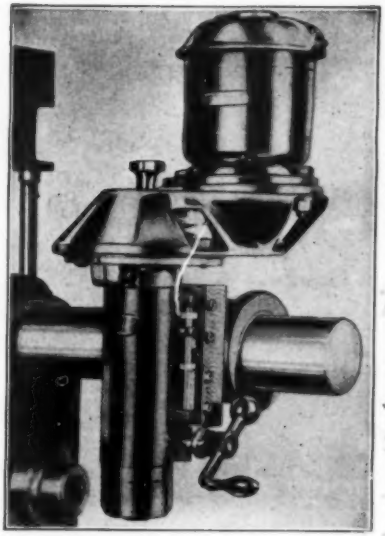

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SPEEDING PLANE ASSEMBLY WITH EXPLOSIVE RIVETS

By D. L. LEWIS

EXPLOSIVE rivets may prove an important factor in speeding American aircraft production and simplifying design.

Now being manufactured in commercial quantities, the rivet is of an entirely new type. A high explosive is secreted in a cavity at the end of the shank. Heat applied to the rivet head by an electric gun detonates the charge. The explosion expands the charged end of the shank, thus forming a "blind" head and setting the rivet.

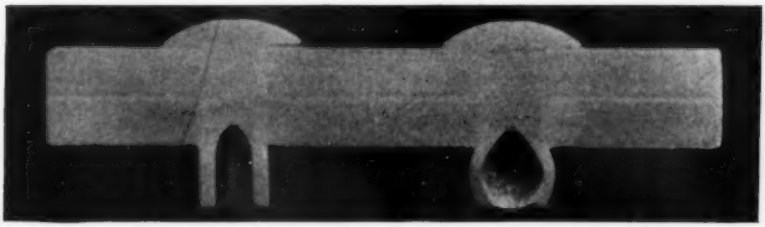
The whole operation is performed from one side with ease and speed. Engineers estimate that from 800 fastening points in an all-metal pursuit plane, to as many as 10,000 in the largest bomber are accessible only from one side. That fact has presented one of the most troublesome bottlenecks in the mass production of fighting planes.

Under the best mechanical methods now employed, a skilled workman can set about two to four of these "blind" fasteners a minute, after they have been placed in the holes. The equipment is comparatively costly.

The new rivets may be installed by one workman at a rate of 15 to 20 a minute, once they are in place. The riveting gun or iron weighs less than five pounds. The rivets themselves weigh only about one-fourth as much as generally used "blind" fasteners of mechanical design.

It is asserted that so finely has the explosive charge been controlled, the expansion it effects may be held within limits of 20/1000th of an inch.

Two years of experimental work by the Explosives Dept. of the Du Pont Co., supplemented by extensive tests of the rivets on airplane production lines in recent months, stand behind the development. Engineers expect the in-



At the left is shown section of one of the new rivets, with chamber for the explosive charge—at the right is section of an exploded rivet.

Here is the simple operation of setting the rivets, exploding the charges by applying an electric heating device to the heads.

vention to have wide applications in industry at large, and to effect radical changes in riveting methods and structural designs.

Much of aviation's phenomenal advance has been made possible by the development of the all-metal designs, preeminently employing the lighter metals such as aluminum and magnesium alloys. This style of construction requires some 40,000 to 500,000 rivets or more per plane, according to the size. The job is one of the most exacting and tedious that confronts plane builders, and grows more so as planes become larger, which is the trend. For example, the recently completed B-19 Douglas bomber, largest ship of its kind ever built, is said to have 3,000,000 rivets.

Gang riveting machines, automatic hole-punching and rivet-driving devices, and the occasional replacement of rivets by high amperage spot welding, have tended to simpify the tremendous fastening problem to an important degree. However, these methods, together with the driving of conventional rivets individually by two-men crews—usually at a rate of two or three rivets a minute—are applicable only in assemblies which permit access to both sides.

There are many structures or portions of airplane structures which are totally or partially inaccessible from the rear. These require fasteners which are capable of being installed entirely from one side, usually termed "blind rivets." Many kinds of mechanical "blind" rivets have been developed, but in general they have compared unfavorably with "bucked" rivets in physical and structural properties, besides being difficult to install economically. So serious has been this diffi-

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culty that it has influenced airplane designs through the efforts of designers to avoid it.

In 1921, an American, Frank Allan, patented several types of explosive rivets and bolts that, he hoped, might prove the solution of the "blind" rivet problem. His rivets did not prove commercially feasible. However, in 1937, a U. S. patent issued to Karl and Otto Butter, two brothers employed by Ernst Heinkel, builder of the famous German plane bearing his name, revived the idea of setting "blind" rivets by expanding the shanks with minute explosive charges.

Early in 1939, the Du Pont Explosives Department became interested in the idea and began seriously to explore its possibilities. From the outset, the Butter rivet seemed to offer advantages over any of the existing types of "blind" rivets and to have great promise, providing it could be further perfected and economically manufactured. At this time Europe was at peace. Accordingly, the North American rights to the invention were purchased from the American Explosives Rivet Co., whose owners had previously acquired them from Heinkel to whom the Butters had assigned their patent. An intensive research and development program was launched by Du Pont's Eastern Laboratory at Repauno, N. J.

Apart from fundamental details, which the patent disclosed, many problems remained to be solved. The design had to be adjusted to American standards of precision, requiring many hours of laboratory test work. A new method for manufacturing the rivet blanks was necessary since the very small tolerances, or allowances for microscopic variations in size, could not be met in existing equipment. The anodizing process, or treatment of the surface to prevent corrosion, had to be improved. Equipment for the ex-

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This was a vital operation, running 24 hours a day on three shifts. Eight times a day the blades had to be sharpened — the machines stopped. One machine alone used *four* 8' blades every seven days.

Luers blades were tried. They had to be sharpened only once every 24 hours. And only one *inch* off of one blade was used every seven days.

Luers patented cutting-off blades and holders are saving time, money, and materials, in addition to turning out more work, because of the design that guarantees adequate side-clearance, back-clearance and free chip expansion.

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Tell us the make and model of your automatic or hand screw machines. You'll get illustrated literature and full information by return mail, covering application to your own equipment.

Produced under license issued by John Milton Luers Patents Inc.

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Simplified Marschke for fast, light or medium grinding or buffing.

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Indianapolis, Ind.

tremely accurate loading of almost infinitesimal explosive charges had to be designed and constructed.

Finally, in the fall of 1940, after they had been tested and evaluated by our Army and Navy, the improved DuPont Rivets were sold in limited numbers to a few aircraft manufacturers for further testing and actual shop installations. These rivets were made on experimental tools but were loaded on production equipment.

Since then, working in close cooperation with American airplane builders, the multitudinous details of manufacture and use have been perfected.

The section photograph shows the Du Pont Rivet, in both the original and installed condition. Prior to installation, the rivet is similar to a solid rivet except for the cavity which is concentric with the shank and open at the shank end. The cavity holds the small explosive charge which, when heated to a certain temperature, detonates and expands the shank end uniformly without cracking. The rivet to the right in the illustration shows the shape of the shank after expansion. Due to the nature of the explosive, no wadding—no confinement—is required.

The heat necessary for installation is supplied by means of a specially designed electric tool with a silver tip, known as the Du Pont Riveting Iron. Application of the iron to the die-formed head of the rivet is also shown.

Time of installation is 1½ to 2½ seconds, from the time the Riveting Iron is applied until expansion takes place. As mentioned earlier, it is possible to install from 15 to 20 rivets per minute, after the holes have been prepared and the rivets placed, with only one man!

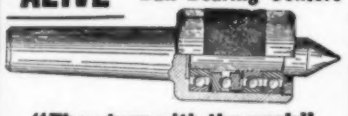
The rivets now being manufactured are of an aluminum alloy. Of varying diameters and sizes to meet structural requirements, they are of the modified brazier head and countersunk types, the latter permitting the flush riveting required by modern high speed planes. The rivets are installed in the "age hardened" condition and do not require refrigeration after heat treatment, so necessary with solid rivets in the same alloy. In shear and tension, these rivets develop values which are approximately the equivalent of driven rivets, the type now most widely used.

The Du Pont Rivets are safe and may be used without fear of serious injury. However, they should be handled with reasonable care. Numerous safety tests have indicated they will not detonate in mass and are quite insensitive to shock and friction. As would be expected, fire or high heat of any kind will cause them to expand.

Those who have been close to the research and development work feel confident the invention will be increasingly helpful in solving many aircraft production problems. Already several million explosive rivets have been sold and are being used in American aircraft that are actually in service.

In addition to their use in aircraft, it is believed these rivets may find many applications in other industries. Manufacture in still larger sizes, and in other metals including steel, does not seem beyond the realm of possibility as now viewed. Time alone will develop the full picture.

"ALIVE" Ball Bearing Centers



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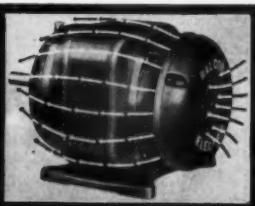
The Beverly Line

No. 1—cuts 14 gage, wt.—16½ lbs.
No. 2—cuts 10 gage, wt.—33 lbs.
No. 3 — Equipped with ball-bearing hold-down device)—cuts 3/16 inch, mild steel or 10 gage stainless, wt.—55 lbs.

Beverly Shear Co.
3005 W. 110th Place
Chicago, Illinois

NEWEST DESIGN
Cool-running MOTOR



Illustrating forced air-movement over entire exterior of motor frame.

BALDOR Streamcooled Design provides a totally-enclosed, ball-bearing motor with an unfailing, NON-CLOGGING cooling system.
BALDOR Glass-insulated motors withstand higher temperatures SAFELY and provide MORE H.P. in smaller frame sizes.
These and many other features at NO EXTRA COST to you.

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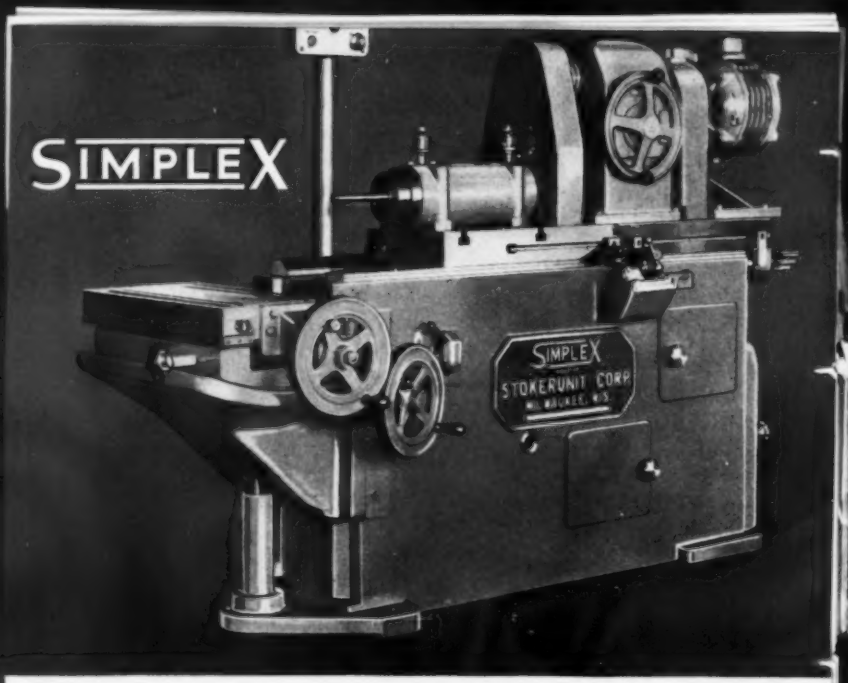
BALDOR ELECTRIC CO.
4368 Duncan Ave., ST. LOUIS, MO.

BETTER MOTORS



A General Purpose Precision Boring Machine

The Simplex Knee Type Precision Boring Machine adds such flexibility to precision boring that a much greater variety of work can be handled on one machine. Vertical adjustment of the knee permits the use of work fixtures of simple design and in a wide range of sizes. This saves much time and expense on short runs.

The table mounted on the knee is provided with a stop and can be hydraulically indexed between two adjustable position stops or can be moved by the graduated hand-wheel and screw. Both table and knee can be equipped with dial indicators and length bars for precision setting when boring a number of holes in one piece. The two standard models are the 2U-KT with 13" x 27" table and No. 3 spindle, and the 3U-KT with 18" x 36" table and No. 4 spindle. Spindles have variable speed drive.

Stokerunit
CORPORATION

★ ★ ★ ★

749 WEST MITCHELL ST. • MILWAUKEE, WISCONSIN

What's New in the Industry

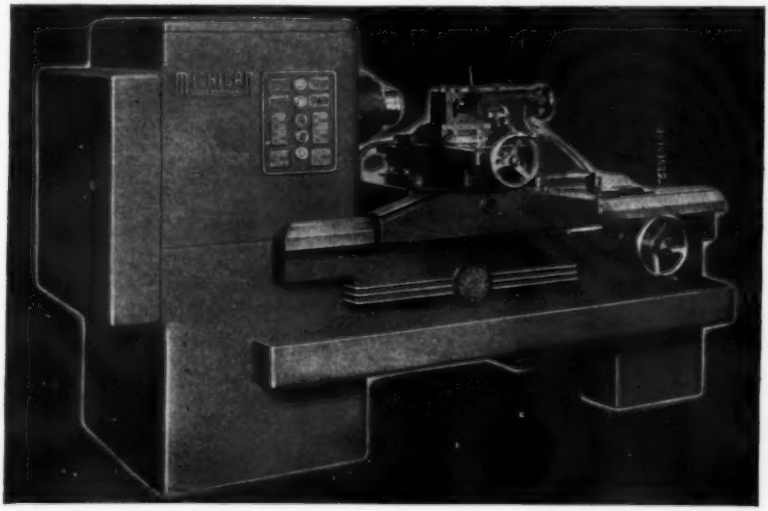
A New Cutter Relieving Machine

DESIGNED especially to simplify and speed the manufacture of rotary cutting tools of various types by concerns engaged in defense production, a new universal cutter relieving machine has just been developed by Michigan Tool Co. The machine is suitable for relieving form, gear and rack cutting tools, end milling cutters, spot facers, etc., with radial or side relief or both.

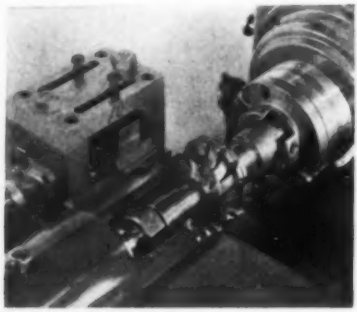
This new machine has been developed from machines used by this concern to produce its own line of "Mitco" cutters and other tools. Included in the design are several new features such as:

Multiple range of forward and reverse speeds to handle virtually all forms of work at maximum efficiency; turntable for cam slide, permitting relieving from any angle; universal adjustable tool box for quick set-up; quick-interchangeable cams; lubrication from reservoirs with inspection portholes.

The machine will handle work up to 8" in diameter, with a maximum length between centers of 24". The number of teeth that can be relieved ranges from 1 to 24. Maximum relieving stroke is ¾". Five relief cams are furnished with the machine. The speed changes, both forward and reverse, are obtained through electrical control. Two reversible motors coupled in such a manner that by operating either one or both motors, seven spindle speeds—



The tool slide may be rotated to virtually any horizontal position to permit relieving of all forms of cutters, including end cutters.



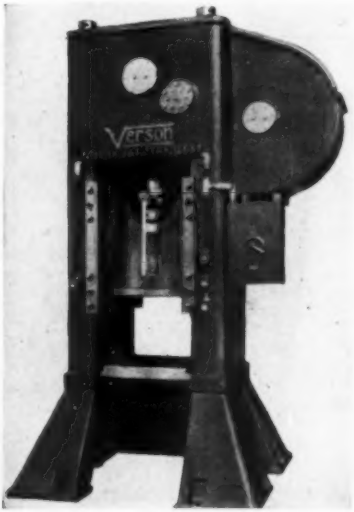
A typical application showing set-up for relieving special form cutter.

(four forward and three reverse)—are available at the touch of a control, while machine is running.

Verson Knuckle Joint Press

Verson Allsteel Press Co. has added a new type knuckle joint press to their broad line of forging, stamping and knuckle joint presses. This new series provides long stroke and long adjustment without sacrificing the very desirable knuckle action of the more common types of knuckle joint and embossing presses.

The new presses are available in a full range of tonnages. The size illustrated has a capacity of 150 tons; a 5″ stroke and a 5-½″ adjustment. The bed area is 26″ x 26″ and the press operates at a speed of 50 strokes per minute. It is equipped with a full



pneumatic clutch and brake unit with electrical push button control for automatic operation. The frame is of fabricated steel construction providing maximum stiffness with a high factor of safety. Various types of feed can be adapted to this type machine. Complete specifications and details are available.

Reising Sub-Machine Gun

An interesting 24-page booklet is offered on the Reising Sub-Machine Gun. It gives the story behind the gun, full specifications, directions for assembly, disassembly and operating, care of the gun, and many other details. A two-page line drawing is included which gives a cross-sectional view of the weapon.

Address Harrington & Richardson Arms Co., Worcester, Mass.

You know what you want from your cutting tools. Here's what users are getting from molybdenum high speed steels, in comparison with the tungsten types.

Equivalent cutting properties Greater toughness Lower cost

These are facts — with nine years' experience in thousands of shops to back them up. Check cost and performance records with any user you like. See your supplier for the proper analysis and heat treatment for your requirements.

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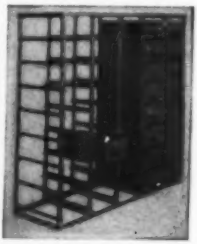
Climax Molybdenum Company
500 Fifth Avenue New York City

MOLY

Universal Centering Chuck

The Universal Engineering Co. Frankenmuth, Mich., announce a new tool known as a centering chuck which, it is claimed, makes a centering machine out of almost any medium size drill press. Bushings are beveled at a 45° angle, forming a conical surface that fits over the ends of shafts to be centered. (Chucks are furnished with a set of collets and bushings to fit various size center drills.) The cone locates the shaft centrally and the bushing guides the center drill. There is a feed out adjustment on the chuck to regulate the depth of the center drill

so that centers will be uniform. It is only necessary to chamfer burrs from the shaft to obtain uniform centers with a few thousandths variation in depth. Work from screw machines that has been centered in one end, can be set on a drill press with a center point and the opposite end centered rapidly. A convenient arrangement is provided for quick removal of center drills and guide bushings.

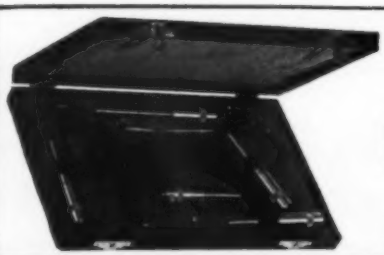


Save Floor Space

Sterling Racks utilize the space above the floor to the best possible advantage. They save time by making contents of all boxes immediately available—no unpiling to get to the right box. Furnished either with or without steel boxes. Made in units of one or five sections—all welded—rigid—non-tipping—non-swaying.

Write for details—tidy-up with Sterling Racks.

STERLING
FACTORY EQUIPMENT CO., Inc.
Providence, Rhode Island.



INEXPENSIVE MICROMETERS

Sold Under a Money Back Guarantee

Complete set $19.95

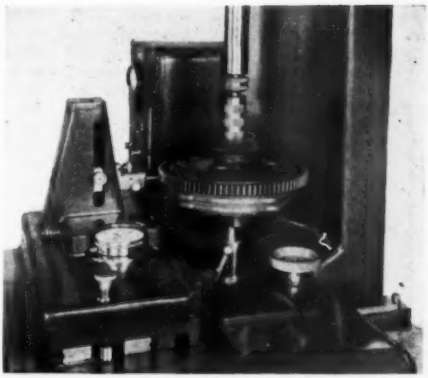
Consists of: 0-1" Micrometer, Outside. 1-2" Micrometer, Outside. 2-4" Micrometer, Outside (2 thimbles). 2½-4" Micrometer, Inside (3 measuring rods). Velvet Lined case.

Write for FREE descriptive Catalog

MICRO PRODUCTS CO.
210 JOS. CAMPAU DETROIT, MICHIGAN

Fellows Involute Measuring Machines

Manufacturers of high-quality gears are devoting more attention than ever before to the production of gear tooth profiles to accurate specifications. To meet this demand, Fellows Gear Shaper Co., 78 River St., Springfield, Vermont, has developed a line of involute measuring machines, the 12M, or medium, size of which is illustrated. These machines operate on a basic principle which eliminates the use of "base rolls," "sine bars," or other methods requiring extra parts or calculations.



The principle employed is based on the use of a master involute cam developed from a larger base circle than the maximum capacity of the machine. By setting the position of the main slide with standard size blocks, the pointer which contacts the involute profile being checked is automatically located at the correct base circle radius. A setting plug, or block, locates the involute pointer in the so-called "starting" position. Provision is also

GRAND RAPIDS
Combination
Tap & Drill Grinder
MOTOR DRIVEN

No. 10-B

SHARPENS TAPS
2-3-4 Flute, Right or Left Hand.

SHARPENS DRILLS
2 or 3 Flute, Straight or Taper Shank.

Grinds DRILLS 1/8" to 1-1/2" and TAPS from No. 6 to 1-1/2".

Other Combinations also available.

WRITE FOR CATALOG

GALLMEYER & LIVINGSTON CO.
405 STRAIGHT AVE., S. W. • GRAND RAPIDS, MICH.

made for checking tooth modifications through a graduated dial which rotates with the work and indicates the included angle of involute profile. This dial in conjunction with the one ten-thousandth dial indicator enables the inspector to accurately determine errors in involute profile, and the angular location of the errors.

It is claimed that these machines greatly simplify the checking of involute profiles. Two methods can be employed. First, the errors can be observed on the dial indicator and graduated dial in the manner explained. Second, the "readings" can be permanently recorded on a paper chart, in which case any deviations from a straight line represent a departure from the theoretical profile. The angular position of the errors is recorded with reference to coordinate arcs.

It is pointed out that these involute measuring machines offer the distinct advantage that change from one size of gear to another is only a matter of seconds. There are no base rolls to change or tapes to stretch.

The machines are available with or without electric recording device. The 6M, 12M, and 18M models provide for maximum pitch diameters of 6, 12, and 18" respectively. Maximum movement of tailstock is 8" on the small and medium machines and 16" on the large. Maximum distance between centers is 13½, 17, and 24".

ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
5364 Northwest Highway,
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WIREGRIP Belt Hooks —6 sizes of tough hooks conveniently carded. **No waste.** Makes smooth humpless flexible joint on all flat belts.
STEELGRIP Lacing — 8 sizes, applied with a hammer. For all flat belts on tough drives. Prevents end fraying.
Here at one source are all belt lacing needs, dependable satisfactory products of guaranteed material and workmanship. *Write for Catalog.*

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ARBOR Presses
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Scientifically designed, accurately machined from selected materials. 40 STOCK SIZES and MODELS (bench and floor types).

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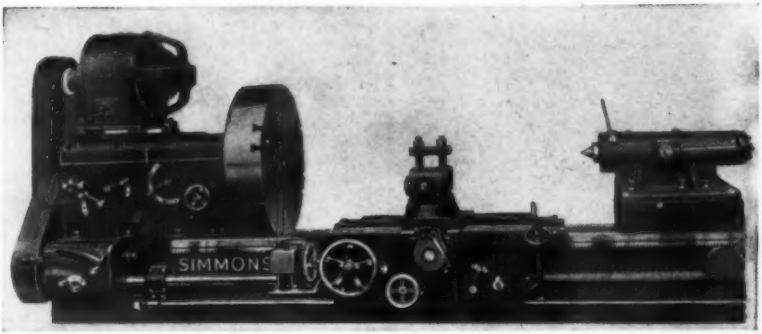
RACINE - WISCONSIN

Simmons 48" Heavy Duty Engine Lathe



An attractive new 48" Heavy Duty Engine Lathe is offered by Simmons Machine Tool Corp.

The bed design provides heavy, thick side walls with double walled cross girts spaced at frequent intervals throughout entire length.

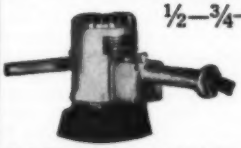
Head is fully enclosed and all bearings and gears are constantly pressure lubricated with filtered oil.

Spindle bearings are extra long and large in diameter. Speed changes are provided to main spindle through sliding spur tooth gears and one heavy jaw clutch. Face plate ring gear is of steel with an outside diameter equal to that of face plate to which it is bolted. A direct reading chart shows selection of spindle speeds.

Carriage has double gibs and can be securely locked in any position on bed for heavy duty cross feeding. Power and hand feed are provided for lateral, cross and angular movements. Compound rest has graduated angular movement and is equipped with (2) massive tool straps with four heavy

CUTS GRINDING COSTS

½—¾—and MORE



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Easy to Install
Convenient Size
Simple to Operate
No Belts to Shift
Infinite Speed Selection in Stepless Speed Changes

Types 1A and 2A Provide up to 3 to 1 Ratio With Power Ratings from Fractional to 4 H. P.

Other Types Available to Provide Speed Changes up to 10 to 1 Ratio.

All Types Available Either In Complete Assembly or Wheel Assembly Only.

If you have a variable speed requirement it will pay you to investigate these devices.

Write for literature and quotations.

THE TOLEDO TIMER CO.
2224 Albion Street, Toledo, Ohio

2 Lock Tool Chests

GS TOOL CHESTS have separate locks for the open top and for the drawer section. Thus only tools needed are outside while others are locked in drawers. INVESTIGATE. Write today for four page folder.
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Motor Driven Precision Cutter Grinding Machine

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PAYS its cost in a few weeks time in — increased production — greater safety — economy of air. Automatically ejects pieces. Operator's hands are never in danger zone. Quickly adjustable air nozzle.

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dial feeds, magazine feeds, hopper feeds, for punch presses. Reels for coiled stock. *Send for Circulars.*

F. J. Littell Machine Co.
4153 RAVENSWOOD AVE., CHICAGO, ILL.

clamping bolts for securely clamping the tools. Power Rapid Traverse can be provided for one or more carriages along the bed. Apron is of double walled construction with heavy bearing support. Feed levers and lead screw nut are interlocked for safety. Lead screw half nuts are made from semi-steel casting with hard babbitt liners.

Leadscrew, 2-15/16" diameter, is made from high carbon turned and ground special screw stock. The threads are first roughed and then finished out after seasoning .

Tailstock is of massive yet compact design. It is clamped to bed with four heavy bolts and also held in position by engagement of pawl with rack in center of bed. A rigid locking mechanism securely clamps spindle. Spindle travel is through a large diameter screw revolving in heavy bronze nut with handwheel at front. Tailstock is moved along bed by rack and pinion and compound gears. Upper section of tailstock is arranged with set-over adjustment for turning light tapers.

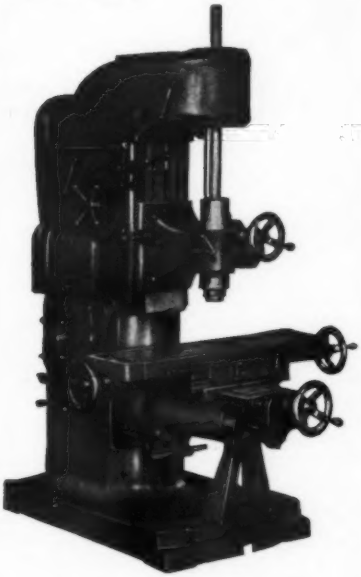
Quick change gear box is a reparate unit, enclosed, bolted and dowelled firmly to bed casting. Gears are all of high carbon heat treated steel and provide an unusually wide range of threads and feeds. Tumbler lever is of cast steel and fits securely in spacing holes to prevent improper meshing of gears. A direct reading index plate shows position of levers for all thread and feed changes.

Swing over bed is 50"; over carriage, 36"; distance between centers (20' bed), 10'6".

Spindle speeds — (No. of gear changes), 9; hole thru spindle is 2¾"; taper of centers, Morse No. 7; number of thread and feed changes 32; range of threads per inch 1—14; range of feeds per rev., standard .021—.296; carriage length on bed 60"; bridge width 20"; width of bed 42"; depth of bed 24"; weight of bed per foot 820 lbs.; diameter of face plate 48"; Motor h.p., recommended 30—80.

Catalog on Knight Millers

A handsome brochure describing their milling machines is announced by the W. B. Knight Machinery Co., 3924 W. Pine St., St. Louis, Mo. These millers are offered in three sizes—small, medium, and large.



These are universal, vertical milling machines with solid, semi-bed type construction, especially well adapted for tool room, experimental, and production work. They have a range of speeds and feeds for the efficient use of small tools and cutters, as well as large. By using the swivel and tilting table features, the need of many special angle plates, angle cutters, and costly fixtures is overcome. Also, dial indicators on the table and saddle movements save preliminary layout time.

These millers are said to provide unusual accuracy for precision boring of jigs and fixtures, and for accurately locating and boring on a production

Self contained and well built. Quick to change for length and diameter, for both shoulder work and gauging from the end. Chips fall away from gauging parts.

A.S.A. Standard bushings with liners to drill any size hole up to ¼" diameter. One bushing furnished with Jig. V block to center work. Can be made any form for holding special pieces. Locking handle can be reversed for either hand.

Let us send you more information.

RACINE SCREW WORKS
RACINE WISCONSIN

WHY WAIT FOR DIES?

Make small runs of many kinds of metal pieces quicker—easier—cheaper—with Micro Die Substitute Machines (Bender, Brake, Shear). Get the work out—save money too! We illustrate the latest model

"MICRO DIE DUPLICATING BENDER No. 1"

A right and left hand operating unit for either right or left hand operation. Two-way direction eliminates conflicting material end when forming. 2½ times greater bearing capacity.

Write for circular **"Metal Duplicating without Dies."**

O'NEIL-IRWIN MFG. CO., 314—8th Ave. So., Minneapolis, Minn.

basis where it is not economical to make special tools.

Anti-friction bearings of both ball and roller type are used wherever desirable. Smooth spindle drive is afforded by hardened, ground, and lapped spiral-bevel gears. Lubrication system is automatic.

The small, or No. 20, miller has a table with working surface 9" x 33½". Maximum distance table to spindle, including adapter, is 19". Power table travel is:—longitudinal, 23"; cross, 10". Motor recommended is 2 h.p. Floor space required is 28"x39". Accessories available include dial indicators, index centers, circular table, horizontal milling attachment, shaping attachment, and other valuable devices. Net weight is 3000 lbs.

The medium, or No. 30, and the large, or No. 40, Knight Millers are of almost identical design but on larger scales. Table sizes are 10"x42" and 12"x46". Their floor requirements are 30" x 44" and 32"x53" with net weights of 4000 and 5900 lbs. respectively.

South Bend 9" Lathe Catalog

A new illustrated catalog covering South Bend 9" Precision Lathes, Models A, B and C, is announced.

Two new models of the 9" Precision Tool Room Lathe are described in this 56-page catalog, as well as the 26 other types making up the balance of the 9" line. Among the uses for these lathes are production operations on precision parts and tool room work. Each of these lathes is designed to handle a wide variety of work, and the information given permits selection of the type best suited to the work.

All attachments, tools and accessories for use with these lathes are shown.

Copies of catalog, 50-B, are available from South Bend Lathe Works, 190 East Madison St., South Bend, Ind.

WANT TO *SPEED UP* SHEET METAL WORK?

★ LIBERT HI-SPEED SHEAR

The LIBERT'S greater speed, versatility, accuracy is making performance RECORDS in Sheet Metal Departments of many of the country's leading Aircraft Manufacturers . . . Helping them keep up the fast pace of Defense Production.

Let us show you what a LIBERT High-Speed SHEAR will do for you in time, labor, money savings . . . There's PRODUCTION PROFIT for YOU in LIBERT Hi-Speed SHEARS!

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LIBERT MACHINE COMPANY, 224 W. Roosevelt St., Green Bay, Wisconsin

Manufacturers of Shears Since 1915

Libert Hi-Speed SHEAR

Swivel MILLING MACHINE *Vises*

Also Mfr's of
Magnetic Chucks
Demagnetizers
Lathe Chucks
Power Hack Saws
Dividing Heads

85 LB. MASTER

HEAVY DUTY 6½" SIZE

$32.55

Suitable for milling machines, drill presses, shapers, etc., these large semi-steel vises may be used plain or swivel. The steel jaws are sturdy. Key slots provide for attachment to machine table holding surface, with jaws at right angle or parallel to table. Junior 4¼" size, 45 pounds, **$23.60**

L-W CHUCK CO.

1-7 N. St. Clair St., Toledo, Ohio

HI-POWER GRINDER

Here's the ace of portable tools—years ahead in performance. Cuts cost corners in a dozen different ways in modern manufacturing plants and repair shops. Indispensable in the tool room. Unsurpassed on mold and die work. Grinds and polishes rough edges off "border-line" manufactured goods, so it will pass even the most rigid inspection. A real aid in repairing machinery or parts on hard-to-handle, heavy equipment.

CHICAGO MOUNTED WHEELS — **FIRST and FINEST**

Made of the marvelous new V/T Super Bond that is causing a sensation wherever tried. Chicago Mounted Wheels actually give 150% to 300% longer life, hold their shape and grind more pieces per wheel faster and without sacrifice to cutting action.

Sample Wheel Free—Tell us kind of job, equipment you use and size wheel you'd like to make a test with.

FREE— MOUNTED WHEEL CHART

Heavy wall chart 22x15" shows actual size and shape of every standard Chicago Mounted Wheel.

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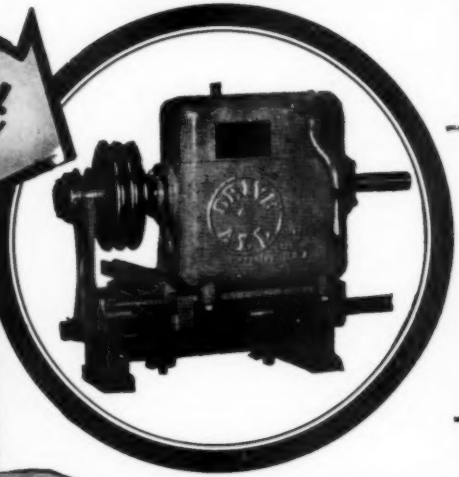

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Punch Clearances

By J. A. SMITH

PROPER die clearance is a debatable factor in die construction. Different shops have different standards, some using 4% of the stock thickness, others 5 or 6% up to as high as 15%.

Endeavoring to analyze this situation by checking with many different tool engineers and tool room foremen, I have learned that most of the standards have been developed in the individual shops for their particular requirements, and the different standards used have a definite relationship to the material which the individual shops run in largest volume.

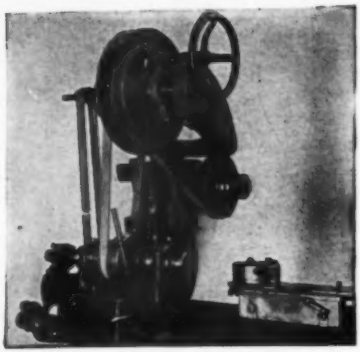
A shop running mostly to thin plate, .010 to .020" thick. cannot use much more than 3 to 4% of the stock thickness for clearance without encountering difficulty with the slug coming up out of the hole, or having a burr on the hole. But if a shop, in which the volume is made up principally of material 3/16" thick and over were to use this amount of clearance, they would experience excessive punch breakage.

In a concern making electrical equipment, operating at least 75 punch presses, the tool room foreman, when asked what clearance he usually employed, stated that he had a definite standard:—1/20th of the stock thickness, or 5%. In view of the fact that about 75% of all their stamping is confined to material 14 to 18 gauge and their big production jobs are either 16 or 18 gauge, his standard is satisfactory in most cases. On the other hand, on stock ⅛" thick, excessive punch breakage is experienced in this plant, and on 22 gauge, burrs and slugs coming up out of the die give considerable trouble.

Another shop specializing in farm equipment, most of the material being ¼ to ½" thick, uses a standard 15% of the stock thickness. This proves satisfactory, except when they run into material ⅛" thick in which case the slugs come out of the die. To overcome this wherever possible, they put a spring knockoff in the punch to keep the slugs down, but actually, reducing clearance on this thickness would accomplish the same result.

These different standards in different shops persuaded us to make a number of experiments on different thicknesses with our patent piercing punches. We found that the diameter of the hole and the thickness of the material to be punched have a definite relation to one another for proper and satisfactory punch performance. This difference follows a fairly uniform curve which has made it possible for us to chart the proper clearances to be used with Durable piercing punches.

While these punches operate with less than standard clearance and cut a cleaner and more uniform hole, it stands to reason that on any piercing, clearance should be governed by the stock thickness and not by a standard



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five, eight, ten or fifteen percent, which a large number of shops are following.

Increased material thickness requires increased clearance, regardless of punch diameter, and we also found the clearance requirements increase as punch sizes approach stock thickness. For instance, on soft cold rolled stock ⅛" thick, being punched with a ⅜" hole and using our punches to get a straight hole through three fourths of the ⅛" thickness, 2% of the stock thickness or .0025" made a perfect hole. With a vertically lapped and chrome plated punch, 25,000 holes were run, after which the punch was still in excellent condition.

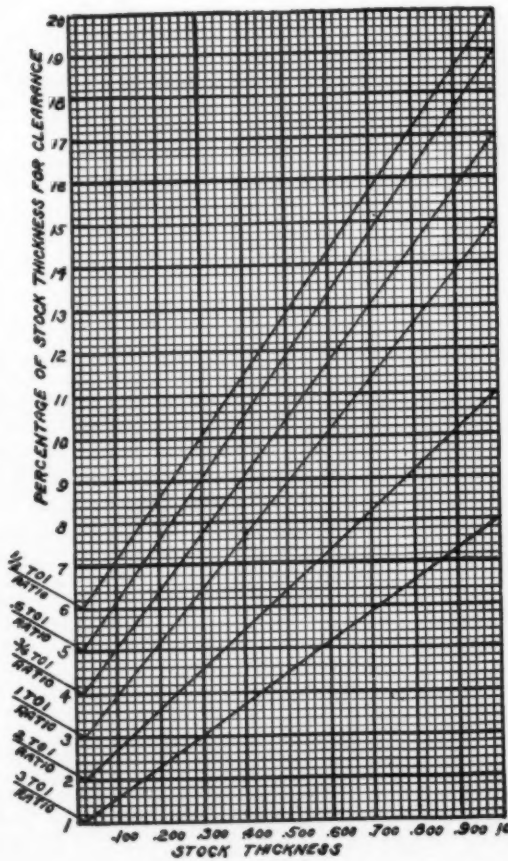
Using the same setup for a test on stock 3/16" thick, we found a slight bulging around the edge of the pierced hole, but when clearance was increased to 3% of the stock thickness, the holes were perfect and no metal distortion was noticeable.

While the increase from 2% on the ⅛" thick to 3% on the 3/16" material may not seem very much, actually it is more than double 2% on the ⅛"—.0025"; 3% on the 3/16"—.0056"; or more than double the clearance found satisfactory on ⅛" thick. On material ⅜" thick, 7½% or .0276" was found necessary, which is about 5 times the clearance required on 3/16" stock.

Further experiments with a punch ⅛" in diameter gave the same results and ⅛" through .037" thick with .0005" gave ample clearance while the same punch piercing stock ¼" thick required 9½% of the ¼" thickness or .024" clearance. Thus, while ¼" thick stock is about 7 times thicker than .037", the clearance required on the thicker piece is almost 50 times as much.

With the information compiled from our own experiments and the information cheerfully given by many of the engineers using our sleeves and punches, we have been able to plot the accompanying chart. This chart is

for soft, cold rolled steel. Harder material we find takes more clearance. Incomplete tests show this increase to be about 3% on 1040 material and when tests are completed we intend to issue additional charts to cover other materials. In the meantime clearance charts for soft cold rolled steel will be sent on request.



RECOMMENDED CLEARANCE BETWEEN PUNCH AND DIE ON DURABLE PIERCING PUNCHES FOR MILD STEEL

Chart shows total clearance. To use it, find proper stock thickness at bottom of chart, and after determining ratio of punch diameter to stock thickness, where correct ratio line intersects vertical stock thickness line, correct clearance percentage will be found in the percentage figures on left of chart.

To find recommended clearance on a given job, first find ratio of punch diameter to stock thickness by dividing stock thickness into punch diameter.

Formula:

$$\div \frac{\text{Punch diameter}}{\text{Stock thickness}} = \text{Ratio}$$

Example:
.260" hole in ⅛" stock.

$$\div \frac{.260}{.125} = 2.08\%$$ Use 2 to 1.

Recommended clearance 3% of stock thickness,
Approximately .004.
Die button hole .264.

Example:
.080 hole in ⅛" stock.

$$\div \frac{.080}{.125} = .64\%$$ Use .6 to 1.

Recommended clearance 6½% of stock thickness,
Approximately .008.
Die button hole .088.

The recommended clearances will punch the hole without taper through 2/3 to ¾ of the material thickness. If a hole must be straight clear through, slightly less than the recommended clearance should be used.

This chart can also be used for brass, copper and aluminum.

Chart is not suitable for standard punches which require considerably more clearance.

If the straightness of the hole is not important, use slightly more clearance to increase punch life.

Courtesy Durable Punch & Die Co., Chicago, Ill.

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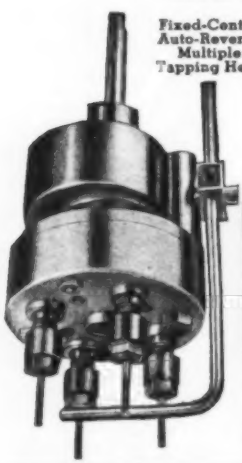

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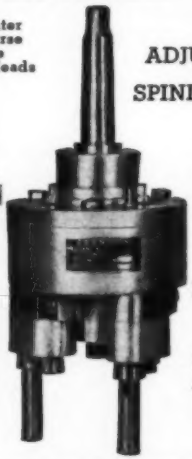

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Positioners for Welding

By ROBERT E. STEWART

WELDING positioners are filling an increasingly important role in the safe, fast production of effective welds. These modern, time - saving devices function most spectacularly in the effortless positioning of large, awkward pieces weighing up to several tons. Positioners are available in many smaller sizes, however, and they bring equally important savings to the positioning of small pieces.

In the present emergency, when time is so precious, the time-saving features of welding positioners are especially noteworthy. The old-fashioned method of positioning heavy workpieces by means of slings and cranes is not only a source of danger but also wastes considerable time. Either the crane and operator are tied up waiting for the welds to be made, or the welder and helpers stand around waiting for the crane. In addition, a large piece may require two men for slinging and crane signaling.

Probably the most outstanding advantage of an efficient positioner in regard to saving time may be summed up in a phrase—"one set-up." This desirable characteristic is well exemplified in the positioners produced by Cullen-Friestedt Co. Their tables tilt from horizontal to 135° from horizontal, tables rotate a full 360°, and height of table may be adjusted, allowing for unusually large pieces. With such great flexibility, one set-up will provide any and every position desired by the welder. The large amount of time saved in positioning the piece for each weld is obvious.

With such a positioner it is an easy matter to use large electrodes and to make every weld "down-hand." As

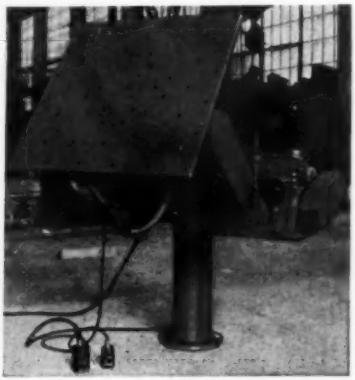
every good welder knows, this is the ideal way to weld. Gravity assists in depositing the metal, which is more readily controlled and solidifies into stronger, neater fillets and beads. Positioned, down-hand welds are not only demanded by good welding practice, but are being increasingly required by government and other specifiers. In addition, down-hand welds are almost certain to show savings in welding and cleaning time.

The safety factor, already alluded to, can hardly be overemphasized. With the present insistence on maximum production, injuries to men and damage to machines should be guarded against with even greater vigilance than usual. Good welding positioners eliminate the need for manhandling heavy masses of steel on the floor—a dangerous practice at best. The use of slings and chains presents similar hazards, even in the hands of experienced riggers.

C-F Positioners include many interesting features in addition to the movements mentioned above. The rotating and tilting movements, of course, are independent in action. Hand wheels with self-locking gears control these movements in manually operated machines, with "free" rotation possible when desired.

For power operated rotation, this same action is accomplished by use of a variable speed drive. This allows the work-piece to be moved by the operator without starts and stops, permitting a continuous weld without change of operator position. The other choice is constant speed table operation, desirable for quick maneuvering of irregularly shaped pieces.

These positioners feature a base column design which is quite advantageous. It is possible, for example, to employ a column-in-floor arrangement which will allow the table to be adjusted to any desired height. The positioner is raised or lowered through crane service and fastened by means of a pin.



The perforated table top permits a wide choice of setting-up means—strap clamps, U-clamps, bolts, and even "tack" welding, which is the most convenient practice in most shops. The table may also be removed and special jigs or fixtures attached.

These positioners are available in four capacities—1,200; 2,500; 6,000; and 14,000 lbs. Table sizes vary from 24" x 24" to 54" x 54".

Inventors

The National Inventors Council, U. S Department of Commerce, offers "Information Bulletin No. 2—How Inventors Can Aid National Defense."

This attractive booklet describes the Council as a central governmental clearing house for receiving inventions and suggestions that might prove valuable to the national defense program. It is the Council's function not only promptly to evaluate these inventions and turn the useful ones over to the proper military and naval bureaus, but also to encourage the public to submit them.

Experience indicates that useful suggestions are generally made by men having technical training as well as practical experience. It is recognized, however, that this is not invariably true, so careful attention is given to every idea regardless of the source. All suggestions are held confidential and will not be disclosed to any unauthorized persons.

It is pointed out that the Council will restrict its activities to suggestions relating to national defense. The Council has no authority to do any development or experimental work on inventions. Other Government agencies may carry on such work, however, on inventions having potential value to national defense.

All suggestions submitted to the National Inventors Council must be submitted in writing and in adequate detail accompanied by all necessary drawings or blueprints.

A list of "instructive literature" for persons not familiar with military requirements is a valuable feature of this information bulletin. Lists useful in various engineering fields are also described.

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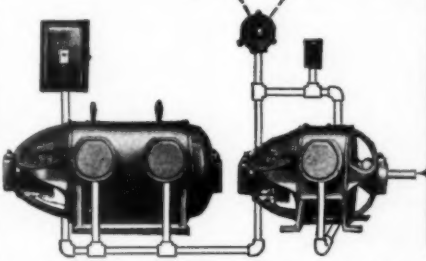

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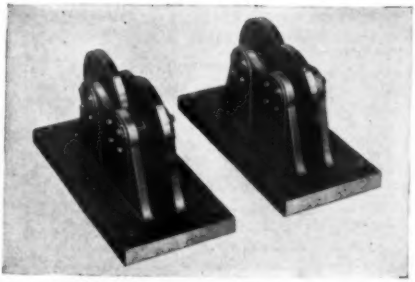

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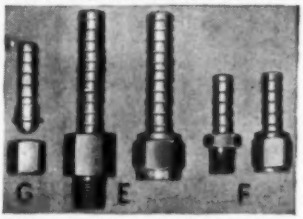

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Hard to Machine?

By Herbert A. Reece

MACHINABILITY ratings have been sought in numerous investigations. A variety of machine tools and measuring devices have been used by research workers for the purpose of determining definite relations between different materials and types of cutting tools. Few of such tests have developed a common standard upon which rating factors for different materials can be based.

Consisting of a drill press, with automatic feed, Fig. 1, on the spindle of which is mounted a head for measuring spindle thrust, the Dalcher tester provides a means for rating machinability on a uniform basis. The measuring head, Fig. 2, consists essentially of two telescoping bodies held apart by an accurately calibrated spring. The upper body is secured to the end of the drill spindle, while the lower body carries a chuck for holding the standard test drill.

Index grooves turned in the chrome-plated outer surface of the lower body provide a means for measuring the amount the spring is compressed during a given test run. To obtain accurate readings while the spindle and test head are revolving, an optical unit, Fig. 3, is secured to the table of the drill press. Light from the lamp is directed by condenser lenses onto the index sleeve. Reflected light rays then are directed onto a screen through an intermediate lens. An enlarged image of the index grooves appears on the screen as stationary lines, easily observed while the machine is in operation.

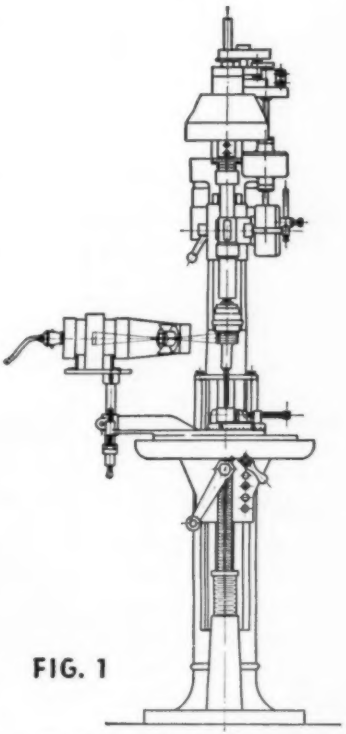

Fig. 1—A standard drill press arranged with automatic feed is equipped with a device for measuring thrust pressures to determine machinability ratings of different materials.

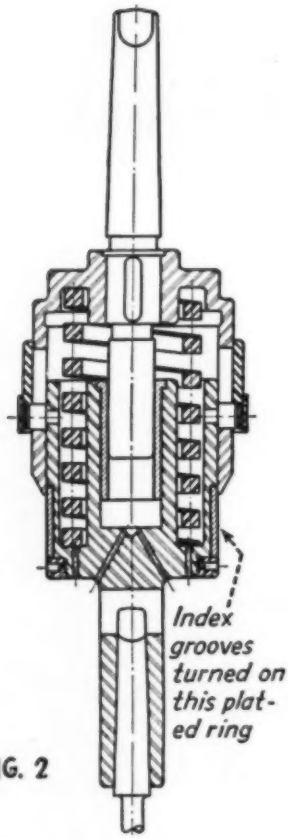

FIG. 2

Fig. 2—The thrust head consists of two telescoping cylinders held apart by an accurately calibrated spring. They are joined by sliding keys so as to transmit power to rotate the drill.

Each test piece first is provided with a small, standard-diameter pilot hole. This eliminates errors due to point pressure on the test drill and insures that only the cutting action of the drill will be involved in the test readings.

After the pilot drill has been removed a standard 3/8-in. diameter test drill is inserted and the drill press set for a proper speed and feed, depending on the material to be tested. The high-speed steel test drills have polished flutes and are ground in a standard drill pointer. Before each use the drill points are inspected under a microscope to make sure that the cutting edges are sharp and that burrs left by the grinder have been removed with a hand stone.

As the test drill enters the material, the calibrated spring is compressed an amount equal to the pressure required. Calibration curves, such as those shown in Fig. 4, are maintained for each test spring. These interchangeable springs are checked at frequent intervals to insure the accuracy of test results. Repeated test runs have shown that values obtained are reproduceable within close limits. Accompanying tables indicate machinability ratings, in terms of thrust pressures, for a number of materials.

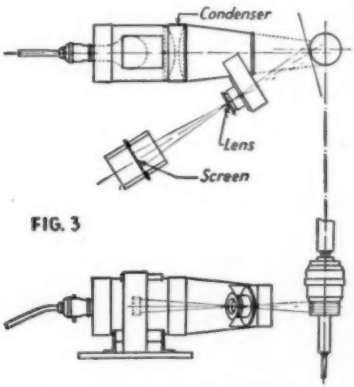

FIG. 3

Fig. 3—Index grooves on the rotating cylinder are reflected onto the fixed screen by the optical head. The operator can determine accurately, the amount spring is compressed during a test run by observing reflections on the screen.

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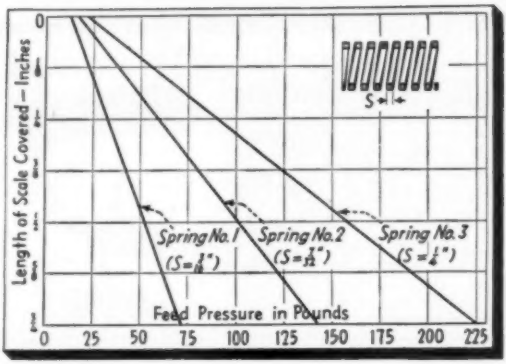


Fig. 4—Springs of differing characteristics can be used, as readings for depth of spring compression are translated into pounds of thrust pressure by charts similar to this. Each spring is recalibrated frequently to insure consistent results.

MACHINABILITY RATINGS FOR CAST METALS

Specimen	Tensile Strength Lb. per Sq. In.	Compression Strength Lb. per Sq. In.	Brinell Hardness	Dalcher Rating Pounds
Gray Iron	26,460	114,000	—	41
Air-Furnace Gun Iron	40,000	—	210-220	58
High-Test Iron	57,000	—	285	67
Ni-Resist Iron	25,000	—	131	38
Meehanite—Grade GA	58,600	176,000	—	49
Meehanite—Grade GB	49,800	164,000	—	51
Meehanite—Grade GC	43,400	152,000	—	48
Meehanite—Grade GE	31,500	126,000	—	38

MACHINABILITY RATINGS FOR S.A.E. STEELS

Specimen S. A. E. Grade	Quench (30 min.)	Temper (2 Hours)	Brinell Hardness	Dalcher Rating Pounds
1040	1525 F.—Water	1150 F.—Air	197	58
1040	1525 F.—Water	1200 F.—Air	183	56
1040	1525 F.—Water	1250 F.—Air	170	62
1040	1525 F.—Water	1300 F.—Air	163	58
1040	No Heat-Treatment	No Temper	152	43
3140	1525 F.—Oil	1050 F.—Air	255	53
3140	1525 F.—Oil	1200 F.—Air	248	56
3140	1525 F.—Oil	1250 F.—Air	241	58
3140	1525 F.—Oil	1300 F.—Air	223	56
3140	No Heat-Treatment	No Temper	302	38
3435	1475 F.—Oil	1150 F.—Air	269	62
3435	1475 F.—Oil	1200 F.—Air	248	58
3435	1475 F.—Oil	1250 F.—Air	255	59
3435	1475 F.—Oil	1300 F.—Air	262	53
3435	No Heat-Treatment	No Temper	197	60
6140	1600 F.—Oil	1150 F.—Air	277	48
6140	1600 F.—Oil	1200 F.—Air	255	49
6140	1600 F.—Oil	1250 F.—Air	223	56
6140	1600 F.—Oil	1300 F.—Air	207	61
6140	No Heat-Treatment	No Temper	152	59

Using Lead

One of the ways in which manufacturers are meeting the shortage in zinc is through die casting lead alloys, according to the "Dutch Boy Quarterly," organ of the National Lead Co., New York City.

It is emphasized that lead alloy castings are nothing experimental but have been employed for years in many fields. They can be successfully electroplated if care is taken in cleaning before plating.

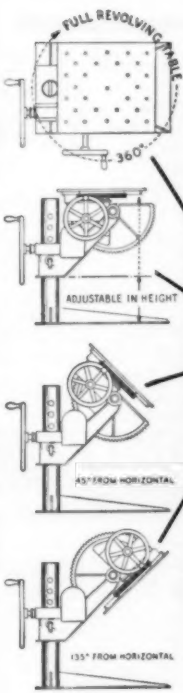
Lead base die castings may also be coated with baking enamels. Air dry lacquers and enamels may also be employed.

The A. S. T. M. specifies two alloys for die casting. One contains 90% lead and 10% antimony. The other contains the same amount of lead, 14% antimony, and 5% tin. It is asserted that most commercial alloys follow these compositions. An antimonial lead alloy known as Hoyt's C. T. Metal has been used for years by manufacturers casting metallic novelties, clock cases, and ornamental metal objects of all descriptions.

Lead-tin-antimony alloys of varying composition are also the standard metals used in the printing trades. In this field the sharpness and perfection of detail in the cast type are important.

Die casters accustomed to using zinc alloys in the manufacture of machine parts, clock, lamp, and fan bases, small tools, and automobile trimmings are canvassing the possibilities of lead alloys. Lead castings have a lower tensile strength. They are strong enough, however, for a wide variety of purposes.

Minor modifications in design often compensate for the lower strength. Lead alloys are also highly resistant to corrosion.



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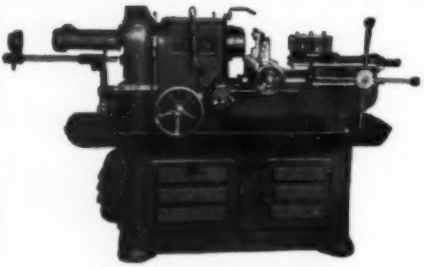

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Automotive Broaching Operations

IN manufacturing the new Ford 6-cylinder engine for cars and trucks, broaching equipment is performing several unusual operations. To assure accurate and uniform alignment of crankshaft bearings, the main bearing cap locking faces of the cylinder blocks are broached in a single pass, while a unique combination assembly and burnishing operation is performed on the water pump and bearing cap body on a single Colonial utility press.

For broaching the main bearing cap faces, a Colonial single ram type of machine with semi-automatic control and a specially designed holding fixture is used. (Fig 1.) The machine rough and finish broaches the surfaces on each side of main bearing bores of the cylinder block in one pass, at a normal speed of 90 cylinder blocks per hour.

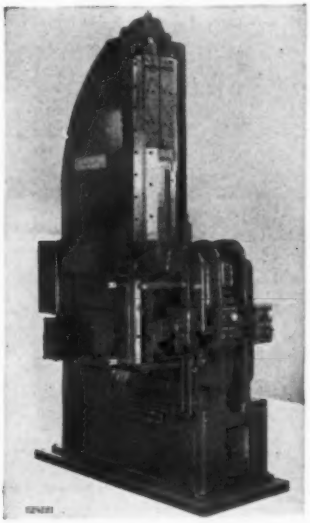


Fig. 1—Special fixture with semi-automatic control mounted, for broaching main bearing "flats."

The handling fixture loads, positions and ejects the cylinder blocks automatically, after the operator slides the blocks on to the handling rails at left side of the machine as shown.

When the machine is started, shuttle fingers make contact with the cylinder block and pull it into broaching position, where a locating pin engages a hole that is accurately machined on center-line of crankshaft bore. After the block is located, it is automatically carried and locked against face of the machine by hydraulically operated clamps, (Fig. 2) after which the ram starts downward and all three pairs of

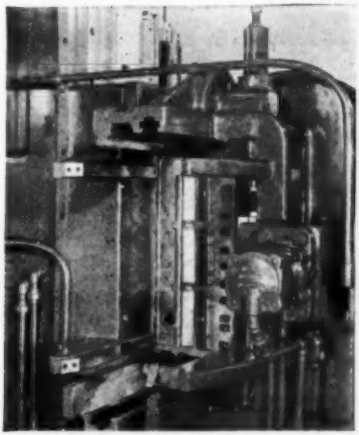


Fig. 2—Cylinder block is locked against face of machine by hydraulically operated clamps. Ram then starts downward for broaching operation.

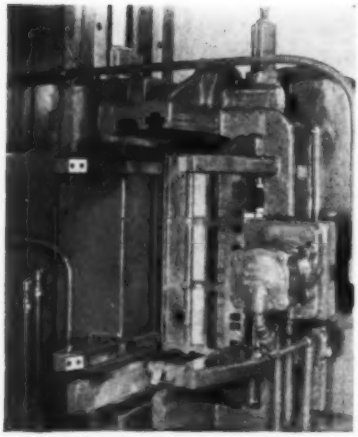


Fig. 3 — Block is automatically pushed away from broach to permit broach to return to starting position. Loading shuttle then returns to reloading position.

faces are broached successively to finished dimensions.

After cut is completed, the block is automatically pushed free of locating pin and away from broach, allowing ram and broach to return to starting position without permitting broach to strike part on return stroke. At top of stroke the ram stops ready for the next downward stroke (Fig. 3). The loading shuttle mechanism also then returns to loading position and the finished part remains in position (as shown in Fig. 3) until the next block is placed upon handling rails. When the cycle is completed, the finished part is ejected to right side of machine (Fig. 4) by a second set of fingers similar to those employed in the loading operation. The block, after completing facing operation, is shown in Fig. 5.

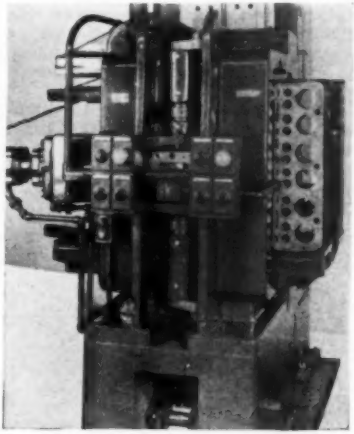
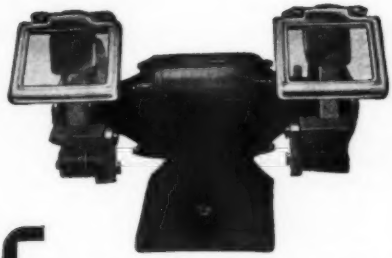


Fig. 4—When the cycle is completed, cylinder block is ejected on right side of machine. Electric button control and part of the clamping mechanism are also shown.

Fig. 5—Ford 6-cylinder engine block after completing the "flat" facing operation.



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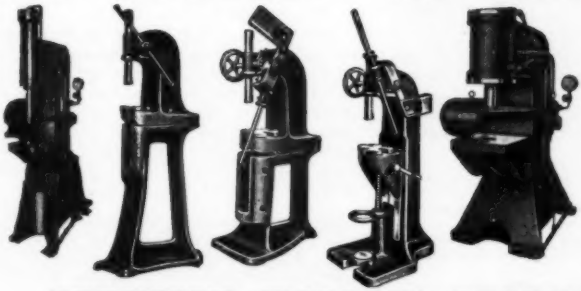

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The machine used for broaching cap faces is a Colonial single ram unit, model VAS-10-60 of 10 ton capacity and 60" stroke. The special base and fixture for handling the blocks were designed by Colonial engineers and the fixture and operating mechanism is considered quite an accomplishment, since all manual operations and human elements are eliminated. The electric button control for starting machine is shown in Fig. 4, which also illustrates part of the clamping mechanism. No experience on the part of the operator is required as the blocks need only be placed on handling rails before starting machine. Operation is hydraulic.

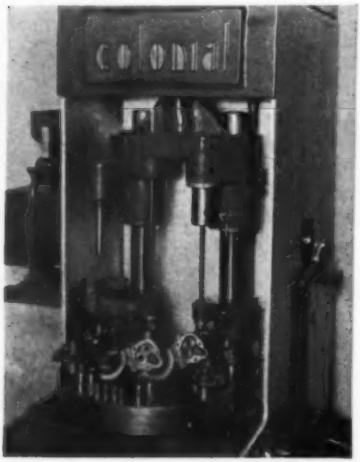


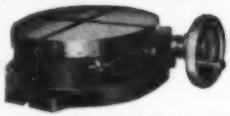
Fig. 6 — Colonial utility press equipped with indexing table and seating and burnishing tools for operations on Ford 6 oil pump body.

The second unusual operation previously mentioned, utilizes a Colonial utility press of 4 tons capacity and 24" stroke, equipped with an eight position indexing table, and furnishes an excellent example of use of a hydraulic broaching press for automatic assembly work. (Fig. 6) In this installation, the plunger holds both a seating tool and a burnishing tool, guided by bars for correct alignment. The part itself is unusual in that the body of the oil pump is integral with one of the main bearing caps.

After placing the pump bodies on indexing table, bushings which are fed from a hopper on left side of machine are pressed into position by the seating tool in the first stage of operation. Indexing table then moves to the next station where a "broach" burnishes bore of bushing to finish size. The entire cycle is continuous and automatic. It is only necessary for operator to place parts in position over locating pins on table and to remove them from indexing table in loading and unloading position of indexing table. Parts are assembled and burnished at a rate of 600 per hour.

The main motor drive in this machine is vertical to conserve floor space, a 7½ h.p. motor being used. A ¼ h.p. motor operates an agitator in hopper. The hydraulic unit operating indexing table is interlocked with ram of machine. The cylinder pulls the plunger, turns indexing table and sets plunger for next station.

TROYKE ROTARY TABLES



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Substitution

Enough aluminum to build 130 two-engine Army bombing planes has been released by use of plastics, steel and other substitute materials in one Westinghouse division, according to a recent statement by A. W. Robertson, board chairman.

More than 1½ million lbs. of aluminum has been withdrawn from 1941 requirements for electric refrigerators, ranges, and other appliances. Other vital defense materials conserved at this plant include more than 150,000 lbs. of nickel and approximately 100,000 lbs. of zinc.

Many of the substitutes proved to be better than the originals, according to Mr. Robertson. In a search for one thing, engineers often have found an improved material or device that they were not trying to find. Under the drive of necessity, they have been stimulated greatly.

Mr. Robertson declared, "We believe it is our duty to continue to promote electrical living. The day is coming when a vast supply of kilowatts must be used by appliances instead of war industries."

An example of material replacement cited was the use of a molded plastic instead of aluminum for a major electric washer part—the turbulator which agitates the clothes. A major saving of material was accomplished, since 1,800,000 turbulators were used in 1940. However, even a tiny part such as a refrigerator shelf slide, by a change-over to another material, conserves 12,000 lbs. of aluminum.

Many new uses have been found for porcelain enamel ware. Westinghouse has started an extensive addition to its vitreous enamel facilities.

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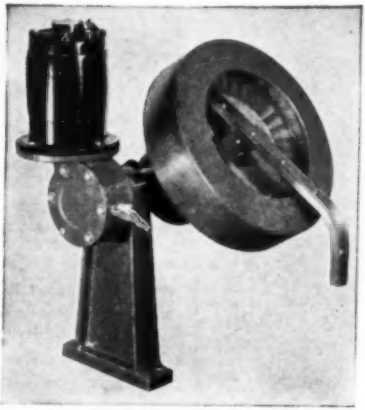

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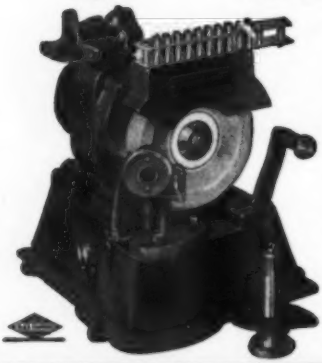

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"Let's Talk Shop!"

Lubrication Fundamentals

By Ernest W. Fair

DOLLARS can be wasted in improper use or handling of lubricants in the machine shop as easily as in production spoilage, if basic fundamentals are not clearly understood and applied in the purchase and use of lubricants for the many types of machines in the shop.

The information presented has been gathered from many sources and condensed in an effort to convey some of the essential points on lubrication maintenance.

The need for lubrication arises from frictional resistance which occurs when one body moves across the surface of another, thus creating a resistance to force. Since friction always tends to slow up, deter or prevent motion wherever gears, bearings or other machine parts operate, the use of lubricants is necessary on the spot of contact.

In machinery use, there are two main divisions of the laws of friction and each requires special handling in the matter of lubrication. One is boundary friction which occurs between perfectly clean, dry, solid surfaces or thin-film friction which occurs between solid surfaces partially or completely separated by a film of fluid, so thin that it can hardly be defined. The other is fluid friction which includes all cases of frictional resistance between solid surfaces completely separated by a film of fluid of sufficient thickness to conform to the laws of fluid drive.

In actual machine shop lubrication practice, conditions of true dry friction seldom occur. When a pair of lubricated surfaces are forced together by a heavy load, the pressure tends to expel the lubricant from between the surfaces. Experiments have demonstrated that it is extremely difficult to expel this lubricant completely.

Scientists have shown that in thin film friction, the boundary film formed by a lubricant on a solid surface has a frictional value that depends on the chemical nature of both the metal and the lubricant. It has been known for many years that animal and vegetable oils possess some desirable lubricating properties not possessed by mineral oils, i. e., they will adhere more tenaciously to metal surfaces than mineral oils but they do lack chemical stability.

When conditions of thick-film friction occur, the frictional resistance is no longer affected by the chemical constitution of the lubricant or the nature of the solid surfaces. It is influenced only by the internal friction of the lubricant itself, which friction is proportional to the viscosity of the lubricant. Viscosity is the property of a

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lubricant on which fluid friction depends; and it is probably the property you hear most about when considering the purchase of lubricants for machines in the shop.

Viscosity, in short, is the property that determines the bearing friction, temperature rise, rate of oil flow through the bearing and the load-carrying capacity of the bearing to a great extent.

The definition of viscosity is based on Newton's law for fluid flow, which states that at any point in a fluid, the shearing stress is directly proportional to the rate of shear. A good example of viscosity is shown in that molasses, pouring more slowly, has greater viscosity than oil. Viscosity is a physical property of an oil just as are density, color, pour point, and fire and flash points. It is the chief property of an oil to be considered in the formation of oil films. It is viscosity which determines the viscous drag, responsible for the pumping of oil between surfaces. Generally speaking, with all things being equal, the slower the motion, the higher must be the viscosity in order to create a complete film.

All authorities emphasize that it is necessary to supply a sufficient quanity of oil to compensate for that lost through end leakage, if a complete film is to be established and maintained. This must be supplied at a point where the film pressure is low. It is also well proven that the greater the load, the higher must be the viscosity of the oil to resist the squeezing out effect.

Crude petroleum itself is the most versatile of nature's resources, with more than 400 primary products being made from it. For lubricating oils, the break-downs are so many that a classification is most difficult to present. Generally they are classified into five groups:— extra light, light, medium, heavy and extra heavy.

Good bearing oils should be medium-bodied, medium-grade oils of the so-called paraffin and red engine oil types. Dynamo or electric motor oils should be light-bodied and high-quality with a viscosity range from 125 to 200 U. S. at 100 degree F, but such oils are

seldom suitable for splash or circulating systems

In general, medium-quality light and medium-bodied oils ranging in viscosity from 130 to 500 U. S. at 100 degrees F are best for external bearings of steam engines. Gear oils will vary from low to high quality and from light to heavy body, depending on the type of gear, method of lubrication, and operating conditions.

Most machinery oils are of medium quality and vary from light to medium body. They frequently resemble engine, bearing and other similar types of oils.

There was a time in machine shop practice when every machine in the plant could be lubricated out of the same can of grease, but increasing specialized development has created a need for divergent types of greases. Consideration must today be given more closely toward seeing that every machine receives the type and kind of grease best adapted for its operation. The safest plan to follow is to use exactly the grease specified by the manufacturer, who has made hundreds of tests seeking just the right kind and type to be used. Order the greases required to fill the specifications laid down by the manufacturer of each piece of equipment in the shop.

Many firms use oils where greases should be employed. When lubrication must be supplied under dirty atmospheric conditions, greases are generally better than oils; also for use on bearings of inaccessible machinery, where freedom from dripping is important, and in similar circumstances.

Greases should be purchased according to specifications determined in practice, or based on authoritative formulas. Here are two examples:—Federal specifications for mineral and graphite lubricating grease, which any machine shop owner can safely follow.

Federal Government Mineral Lubricating Grease Specification

General Requirements:—Mineral lubricating grease shall be a smooth, homogeneous mixture of mineral oil and pure odorless lime soap made from

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animal or vegetable fats or oils or fatty acids, completely saponified with hydrated lime, and shall be suitable for the lubrication of such parts of motor equipment and other machinery as are lubricated by means of compression cups, and for use in ball and roller bearings.

Mineral lubricating grease shall contain no fillers such as rosin, rosin oils, talc, wax, powdered mica, sulfur, clay, asbestos, or other undesirable or deleterious impurities.

Mineral lubricating grease shall possess only a slight odor of mineral oils and may be rejected if it has any other distinct odor.

Federal Government Graphite Lubricating Grease Specification

Graphite lubricating grease shall be a smooth homogeneous mixture of mineral oil, graphite, and pure odorless lime soap made from animal or vegetable fats or oils, completely saponified with hydrated lime.

Flake graphite shall be used that is free from grit and that contains at least 82 per cent of graphitic carbon.

These two specifications are well worth keeping in mind in choosing shop grease requirements.

Lubrication a few years ago could be a hit-and-miss proposition, but even then, maintenance costs were high simply because of this neglect.

Maintenance costs today can be reduced by lubricating with care and intelligence, and seeing to it that each lubricating point in the shop gets just the type of lubricant it requires!

Do You Dodge Thought?

By W. F. Schaphorst, M. E.

Among workers are you an exception to the rule? Have you ever asked yourself that question? This rule, according to a good friend of mine, is that most workers do not like to think. In fact, it has been said that there is no length to which some folks will go to avoid thinking.

As for me I am inclined to disagree with my friend, but for the sake of readers who may be benefited by an exposition of their faults (there may be a few so-called workers of that type) I give the following extracts from a letter which my friend had the kindness to write me on the subject:

"Few workers approach the work before them in a receptive inquiring frame of mind; they do not become deeply interested; ideas do not crowd themselves for expression in the man's mind as they do in the mind of his foreman, for instance. That's why the foreman is a foreman.

"I do not mean to say that all workers are unimaginative, but I am convinced that many of them accept conditions as they find them, wherever they may be employed. They do not concern themselves very much with the 'whys' and 'wherefores' that interest a man of an investigating turn of mind, who is ambitious to rise above his surroundings and become a leader among his fellow workmen. To them 'sufficient unto the day is the labor thereof' and the wage at the end of the week.

"They have no driving ambition to

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get ahead; they do not collect material as they go along doing their daily work; all days are alike to them physically and educationally; they never think of thinking at their work, and they all dub the foreman as being a 'lucky dog' and a man who just pulled the political strings at the proper time. They also seem to have the idea that as soon as a man becomes a foreman, there is a sort of alchemy that immediately puts a boss's thoughts into the foreman's mind."

I believe I have given enough of my friend's letter. You can at least get his idea. It is full of good, wholesome food for thought, and if there is a word here or there that fits our own case, it is obviously up to us to put on the coat. My friend surely means well. He is honest. And honest criticism can hardly do any of us any harm.

Jessop Chrome Steel Bulletin

"Jessop 3 C" is the title of a new bulletin by the Jessop Steel Co., 603 Green St., Washington, Pa. It describes "3 C," a high carbon - high chrome steel especially recommended for blanking dies on high silicon transformer sheets and other difficult assignments. This bulletin also has considerable data of value on hardening, tempering, and other characteristics of 3 C.

How To Select Small Electric Motors

The proper selection of ⅛ to ¾ horsepower motors for light industrial and household use is quickly made from this thumbnail table compiled by the Westinghouse Electric & Mfg. Co.

Type and Sizes	Where to Use	Features and Characteristics	Power Supply	Speeds
SPLIT PHASE HIGH TORQUE 1/6, and ¼ hp. High Starting torque.	Woodworking tools, sump pumps, tool grinders, home workshops, and similar equipment not starting under heavy load.	Sleeve bearings. Indestructible rotor. Rigid or resilient mountings.	Single phase 60, 50, or 25 cycles, 110 or 220 volts.	1725 rpm. on 60 cycles; 1425 rpm. on 50 or 25 cycles.
SPLIT PHASE GEN. PURPOSE 1/20 to 1/3 hp. Medium starting torque.	Fans, blowers, oil burners, centrifugal pumps, unit heaters and other easily started machines. Use where frequent starting is required and normal starting and running torques are sufficient.	Low starting current prevents light flicker. Sleeve bearings. Ball bearings, Thermoguard optional. Quiet running. Reversible. Rigid or resilient mounting.	Single phase 60, 50, or 25 cycles a-c 110 or 200 volts.	3450, 1725 or 1140 rpm. on 60 cycles; 1425 rpm. on 25 cycles.
CAPACITOR START, GEN. PURPOSE. 1/6, ¼, 1/3, ½, and ¾ hp. Extra high starting torque.	Pumps, machine tools, refrigerators, compressors, water coolers, air conditioners and similar equipment needing heavy starting power.	Capacitor gives low starting current — prevents light flicker. Few wearing parts. Quiet. Thermoguard optional. Rigid or resilient mounting.	Single phase 50 or 60 cycles a-c; 110 or 220 volts for ¼ hp. and smaller. Larger sizes, 110-220 volts.	3450, 1725 and 1140 rpm. on 60 cycles; 1425 rpm. on 50 cycles.
POLYPHASE 1/6, ¼, 1/3, ½ and ¾ hp. High starting torque.	Companion to single phase motors. Special designs furnished for hoists, etc., that require extra-high starting torque.	All ratings permit starting across line. Rigid mounting standard. Ball bearings optional equipment. Sleeve bearings standard. Protection usually provided in control.	2 or 3 phase; dual frequency 60, 50 cycles. 110, 220, 440, 550 volts.	3450, 1725 and 1140 rpm. on 60 cycles; 1425 or 960 on 50 cycles.
DIRECT CURRENT 32, 115 and 230 volts.	Suitable for all direct current applications.	Ratings below ½ hp. may be started across line. For ratings ½ hp. and above, starting rheostats are advised.	Direct current 32, 115 and 230 volts.	1725 and 1140 rpm.

Carbide Tool "Do's and Don'ts"

IN view of the tremendous increase in usage of carbide cutting tools and the large number of newly trained men being employed, particularly in connection with speeding defense production, we are reproducing a table of simple "do's" and "don't's" to remember in connection with such tools. While they do not cover all carbide problems, their observance will assist in vastly reducing tool spoilage and breakage, and improve performance.

ALWAYS:

Use a flat, rigid base.

Set tools approximately on horizontal plane.

If necessary set tool short of desired length and adjust from rear.

Use tool-holders designed to hold tool on horizontal plane.

Back out tool when tightening clamping screws.

Use dog-point or flat clamping screws.

Cut overhang to minimum.

Always allow tool to cool naturally.

Use generous coolant flow. If possible, force coolant **under** chip and against cutting edge

Always disengage feed before stopping spindle.

Always use silicon carbide or diamond wheels for grinding tip.

Sharpen carbide tools at regular intervals to get longest life.

Keep tool moving across wheel when grinding to avoid localized overheating.

NEVER:

Never use rocker support under tool.

Never set tools above or below center line.

Never use hammer on cutting end of tool.

Never use inclined tool holders.

Never have tool against work when tightening clamping screws.

Never use pointed clamping screws.

Never leave excessive overhang.

Never dip tool in any liquid while tool is hot.

Never use weak stream of coolant.

Never stop spindle before disengaging feed.

Never use "any old wheel" for grinding carbide tips.

Never run a carbide tool until it will not cut any more.

In grinding carbide tips don't hold tool motionless too long against wheel.

IF TOOLS CHATTER, LOOK FOR:

1. Excessive tool overhang.
2. Insufficient end cutting edge angle
3. Too large a tool nose radius.
4. Insufficient feed.
5. Too much tool clearance (tool relief angles).
6. Rake angles too large (decrease as a 'last resort').
7. With hand feed on plunge cut tools (grooving, cut-off, etc.) increase rate of feed in proportion to increase in rate of speed (Example: If you double the speed, double the rate of feed.)

IF TOOLS WEAR RAPIDLY, LOOK FOR:

1. Insufficient feed, causing rubbing action.
2. Insufficient clearance (tool relief angles).
3. Excessive chatter and vibration.

(Courtesy Carboloy Co., Inc.)

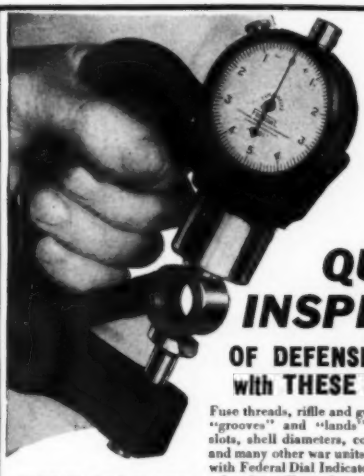
Business

The rate of business activity continues to move steadily upward, with no signs of any slackening in the pace of the advance. Some slowing down in a few industries is more than made up for by the speeding up in others where new machinery has been installed and new plants have been constructed. Expansion has taken place in consumer goods lines, as well as in industries furnishing military supplies and equipment, although the increase has not been quite so great.

The extent of the advance in production is measured by the La Salle Index of Business Activity. That index is now 50% above the average level during the last three years, and 30% higher than it was a year ago. Present indications are that it will advance several per cent more this month even though the usual trend is a slight decline in production during July.

The most striking advances in recent months continue to be made in the same industries as have been forging ahead during the past year. These are the machinery, aircraft, and shipbuilding industries. Other factories producing durable goods, such as automobiles, railroad locomotives, lumber products, and metal products, are also operating at high rates and are turning out over 50% more goods than they did last year at this time. Those industries producing nondurable goods which are sold mostly to consumers, such as meat packing, food and dairy products, chemicals, shoes, textiles, paper, and fuels, are producing 20% more.

These facts are presented in a recent issue of the "Business Bulletin" of LaSalle Extension University, Chicago.



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OF DEFENSE MATERIAL with THESE DIAL GAGES

Fuse threads, rifle and gun bore diameters on both "grooves" and "lands", depth of recoil cylinder slots, shell diameters, concentricity, wall thickness and many other war units can be inspected quicker with Federal Dial Indicator Gages. The following are a few that will speed up your inspection.

MODEL 264 P-101 SNAP GAGE

This modern Snap Gage is fast and positive. Adjustable for size, positive upper anvil pressure, insures uniform gaging.

Model 45 B-60	**Pitch Diameter Gage**
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Model 1330 P	**Snap Gage**
Model G3FP	**Gun Bore Gage**
Model 36 B-6	**Small Hole Gage**
Model 1201 P	**Long Hole Gage**
Model 49 P	**Caliper Gage**
Model 165 P	**Plug Gage**

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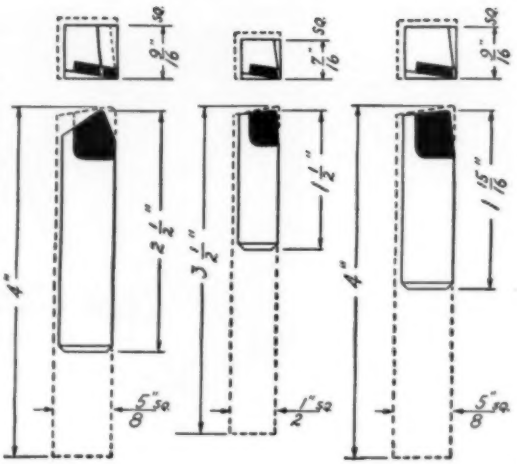
The extent to which it is practicable to alter carbide tipped standard tool bits to meet special requirements is here shown from a drawing used by a prominent New Jersey manufacturer. He specifies Carboloy standard bits No's.T-75 (center) and T-77 (left and right) as shown by dotted lines, and reshapes them to form and dimensions shown by solid lines. By utilizing standard bits in this way, the time necessary, under present defense conditions, to obtain special tools is eliminated in addition to the cost saving made possible by the low prices on standard tools.



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1' Collet Capacity—
Ball or Roller Bearing

No. BB U-1136 WQ Sheldon 11' swing 36' between centers pre-loaded ball-bearing spindle, hardened and ground all over, inside and out with 1⅜' hole thru center, hand scraped bed, ways (2 V-ways, 2 flat ways) full quick change gear box, worm feed apron with power cross feed, thread chasing dial and 4-speed lever operated underneath pedestal motor drive, and telescopic taper attachment.

Write for Catalog showing complete line of Sheldon Precision Tool Room and Manufacturing Lathes, attachments and accessories; Sheldon Arbor Presses and Sheldon Drill Press and Machine Vises.

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Health

A pamphlet is announced, of unusual significance in these strained times when every ounce of strength and stamina must be utilized to its fullest extent. It is more than ever a vital necessity that the health of the industrial worker be safeguarded.

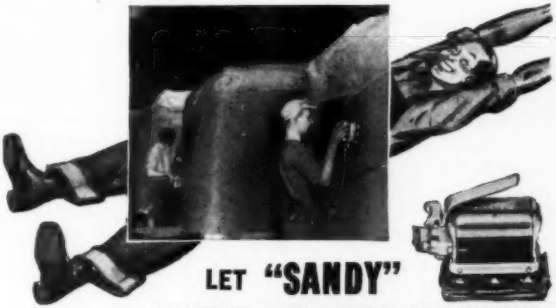
Recognizing industry's responsibility for working conditions, almost four years ago the National Ass'n of Manufacturers organized its Committee on Healthful Working Conditions to study the problems involved in maintaining the maximum degree of health among workers and to assist in all ways possible to bring the solutions of these problems into more widespread being.

The survey, of which this pamphlet —"Industrial Health Practices" —is the report, is the most representative one on the subject ever completed. It contains replies from over 2,000 plants throughout 47 states, employing almost 2,000,000 workers.

The report discusses the value of a factory health program. It points out that such a program is dictated not only by humane considerations but is also a paying proposition in cold dollars and cents. Physical examination policies are examined.

Representative features of factory health programs are studied. Age and cost of health programs are surveyed.

Single copies are available free to NAM members and non-profit organizations. A charge of 50c a copy is made to all others. Special prices are quoted for quantity orders. Address National Ass'n of Manufacturers, 14 W. 49th St., New York, N. Y.



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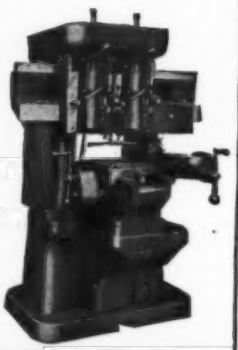

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Torch and Arc Repairs

By Arthur Havens

Broken frames, cracked cylinder saddles, parts worn too badly for safe use, boiler failures due to worn or cracked sheets—all of these and many others are the weldable ailments presented to railroad management and cured by welders.

The major part of the welding in the back shop is repair work, although fabrication is rapidly coming to the fore on many locomotive parts. Railroad welders are all hand operators, and among them you will find some of the most expert welders available.

Always on the look out for new applications of their trade, these men are ready and anxious to try any job that seems reasonable.

Putting ⅛" layer of bronze on box that had been in service for over 100,000 miles.

Quite recently a locomotive was found to have a serious crack, running from the cylinder bushing out through a stud hole, on through the heavy part of the cylinder and up the face of the saddle, about 8". Normally the bushing would have been removed, the crack chipped out, the cylinder heated and a big job of brazing done. The engine was needed for service though, so the

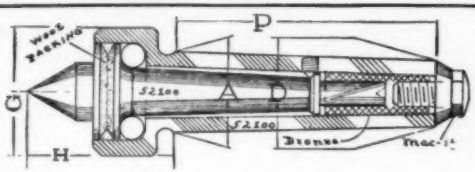
welder was requested to make a temporary repair.

He had a mechanic chip out the crack, then arming himself with torch, rod, flux, air hammer and bobbing pin, set to work. The stud hole was filled first. After applying about 1/3 of the required amount of bronze, he belabored the bronze with air hammer and bobbing pin, stretching the bronze to compensate for contraction. This method was carried out until the entire weld was complete. The cylinder head seat was ground off with an air grinder and finished with a scraper. A new stud hole was drilled, a stud applied, the cover replaced, and the locomotive was ready for service all in less than four hours. The engine is still in service, which proves the worth of intelligently handled emergency repairs.

At the moment, one of the "hottest" subjects among those interested in railroad welding is the often-tried but seldom successful practice of bronze welding driving box hub faces. This can be done satisfactorily by observing a few simple rules and following a short procedure control. It has been determined that the applied metal should be kept down to a minimum, about ½" thick. This is accomplished in the preparation of the box for welding. In the event the box is an old one, or has been grooved for a poured liner, the difference is made up by arc welding the groove level with the top of the box. Coated rod of ⅜" diameter is used for this procedure, applying one layer atop another until the box is ½" under the desired finished size. A strip of 3/16"x½" tank steel is bent to the contour of the outside of the hub face. This strip is tacked to the box to act as a dam for the molten bronze. Keeping this strip as nearly a true circle as possible will aid the boring mill hand in machining this strip from the box when he faces the hub surface.

Boring driving box that was repaired by brazing hub face.

If the crown brass is not in place when the box is brazed, a similar strip is placed inside the box for the same purpose. In this manner, the crown brass can be machined to fit the inside



IF it is easier to Roll a heavy Barrel, than to Drag it, the Rigid Live Center is a positive Economy, which makes your $2,000 Lathe worth $2,200.

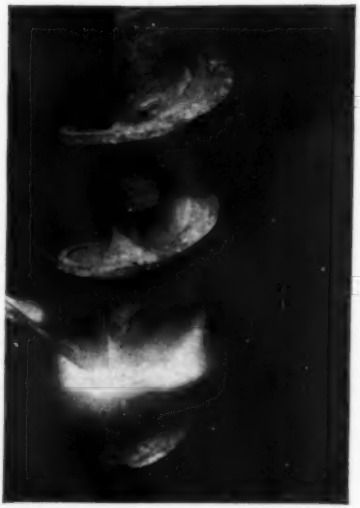
It has never made a failure or lost a purchase dollar.

RIGID TOOL CO., **2000 Witherell St., Detroit, Michigan**

of the hub surface perfectly.

The driving box is a heavy mass of steel. Therefore, a large welding head is needed to heat the box sufficiently to apply the bronze. There is a specially adapted rod on the market for this purpose, ½" by 18" cast bronze. However, standard grade wear-resisting bronze in the 3/8" by 36" size answers the purpose successfully. It is customary to use one rod at first and to tin the box ahead for 6" to 8". Then when building up to the desired thickness, as many rods are used as can be handled efficiently. This operation can be completed in one hour on the average box, but even if it takes longer, it is still a long way ahead of the poured liner.

Speaking of saving, it might be well to mention the welding of locomotive stoker screws. This is a standard practice and a very profitable one. Stoker screws that might otherwise be thrown in the scrap are reclaimed and made as good as new. Sometimes these welded screws are even better than new ones



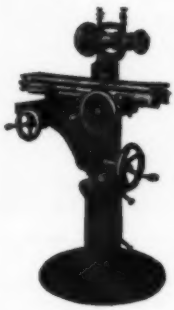
Rebuilding worn stoker screw

for the welded material is often of a much higher grade than the original cast steel. In fact, it is a practice on one road to rebuild the flights of their elevators with wear-resisting rods. While this incurs a little additional expense, the resulting long wear pays a nice dividend.

Usually the diametrical wear is so great that welding alone would not be profitable. In this case, the screw is machined to a diameter 1¼" under the finished size and a steel band of ⅝" square stock fashioned to the edge of the flight. The square strip is cut into pieces about 6' long, to facilitate handling, the operator tacks one of these strips to the bottom of the flight, alternately heating and bending, he shapes the bar tightly to the flight. An occasional slight twist of the square with a monkey wrench will keep it aligned with the flight. The strip should be tacked every 10". When this strip is in place along the entire flight, the screw is upended and the space between the strip and the hub rebuilt to its original thickness. A short piece of pipe held securely in a hole in the floor makes a convenient place to put the elevators while welding. The flight of the stoker screw is generally so badly worn that it takes a great deal of weld metal to return it to its normal thickness. A few years ago with the best equipment available, it was frequently impossible to heat a part sufficiently to apply a great deal of material. With the innovation of the new torches, this difficulty has been overcome and the amount of material applied is entirely up to the operator's ability. In fact, some operators use two 5/16" rods at one time.

The railroad welder is a prolific "builder-upper" for fully 60% of his work consists of rebuilding worn parts so as to permit machining to a size comparable with the parts in direct contact with them. Piston heads and bull rings are seldom changed unless they are broken. When pistons are removed because of excessive wear, the bottoms or worn parts are rebuilt with a good grade of long wearing bronze.

"GREENFIELD" Universal Tool Grinder



Now —

A Production Product

The "Greenfield" line consisting of the No. 3 Motor-in-head Grinder, the No. 2 Tool and Cutter Grinder and the No. 190 Grinder is now being manufactured by the Production Machine Co.

We have taken over the production of the "Greenfield" line because we feel they are of the same high quality as our horizontal and vertical Reed bench and floor Sensitive Drills, our Centerless Polishing Machines, and our horizontal and vertical Surfacing Machines.

PRODUCTION MACHINE CO.

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THE CATSKILL MODEL R

Power Reaming Machine

Eliminates hand reaming. Saves time and money. Improves your work. Speeds up removal of burrs from tubing as well as from bores after keyseating or drilling of set screw holes. The Catskill also saves money on finish reaming, countersinking and counterboring, smoothing off and chamfering sharp edges of round bar stock and many other finishing jobs.

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The "27" MOREY

Semi - Automatic Heavy Duty LATHE

Just the Machine for Shell Work !

Suitable for rough or finished turning shells at maximum feed.

Put your shell operations on this fast powerful lathe and turn out your work at top speed up to the limit of tool capacity.

Multiple tool holders can be supplied at front and rear; a turret mounted on separate saddle can be used instead of tailstock.

Full use of carbide tools can be taken by this heavy duty lathe. ***Ask for Circular No. 715.***

Morey Machinery Co., Inc.

410 Broome Street, New York, N. Y.

Although a piston may be worn as much as 5/16", it makes no difference because it's as simple to apply enough to machine 5/16" as ⅛", providing a few precautions are taken.

Some piston heads or bull rings, due to the porous nature of the cast iron, soak up oil and when the operator attempts brazing, he finds that regardless of the care he takes in applying the bronze, the metal will be full of blow holes. This porosity is caused by the eruption of the tiny gas pockets, made and liberated by the heat of the torch. To prevent this, heat the area to be brazed to a dull red heat and allow it to cool. As this surface does not tin readily, it is a good plan to grind this area with a portable grinder. When brazing a piston, the operator should deposit the bronze on sort of a side hill, i.e., keep the piston rolled toward him. In this manner it is a simple matter to apply any thickness of bronze required.

Smoke stack rolled and clamped ready for tacking.

Rebuilding locomotive tire flanges has, at one time or another, been a standard practice on most railroads. Some of the roads have abandoned this practice because of broken tires. This is unnecessary and tire flanges can be welded without trouble if the operators will follow a certain procedure control.

The tire should be removed from the wheel and laid on steel horses in a flat position. It should be preheated to a sizzling heat. A minimum of three operators welding at the same time will lessen the distortion. As soon as the welding is completed, the tire is reheated and allowed to cool. It can then be expanded and remounted on the wheel.

Although I mentioned that there was little fabrication in the railroad shop, I should have qualified by saying little in comparision with the building up and welding of broken parts. More and more parts and equipment are being made from welded steel every day. Smoke stacks, petticoat pipes, exhaust bases, and back plates are made from welded plate. In fact the entire front end is all welded.

Wooden pilots have been replaced with steel ones fabricated from scrap flues and angle iron, making a more rigid and better looking pilot. The welder makes the entire pilot, bending his own angle iron for the nose piece; then setting it up on the bench and welding the top angle and back braces in place. The scrap flues are cut in the shears to proper lengths. Shearing flattens them just enough for welding. These all-welded pilots are made standard for all types of locomotives on the road thus eliminating a lot of different jigs and patterns and making the pilots interchangeable.

No text on welding would be quite complete without at least mentioning frame welding, for it is one of the biggest and toughest tasks that the railroad welder encounters.

When the acetylene process was adopted for frame welding, some 25 years ago, it was then considered the only acceptable method. However, since the innovation of heavy coated rods, locomotive frames are welded with the arc with exceptional success. Shielded arc welding of locomotive frames requires a little more preparation, in so far as the scarfed surface must be chipped free of all oxide before welding. Then during the welding, each layer should be cleaned and peened with an air hammer and bobbing pin. It accelerates this operation to employ two operators, and the largest rod available should be used. Usually ¼" works out nicely. When possible, the weld should be reenforced. About ½" to ⅝" thick is sufficient.

Welding broken frame with the shielded arc.

Welding surely plays an important part in railroading today. It is hard to believe that just a few short years ago, there was no welding or cutting at all. It must have been tough going when it was impossible to call a welder everytime a machinist or boilermaker got in a tough spot.

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Spot Welders
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Lower Cost!

Features include: transformer which guarantees faster heat, stronger welds; water cooled electrodes and tips; automatic trip switch; adjustable arms; swivel pedal; and heat regulator.

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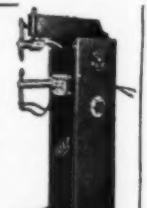


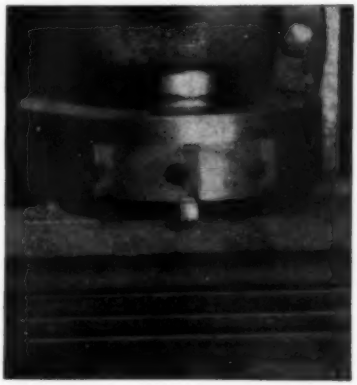
Inserted Blade Cutters From Standard Tools

A novel idea for making tungsten-carbide multiple inserted blade cutters, effective in reducing the cost and speeding up the manufacture of such cutters, has recently been adopted by a number of manufacturers, including the C. A. Porter Machinery Co.

The idea, basically, consists of using the new standard low-cost Carboloy turning, facing and boring tools, as inserted "blades" for the multi-bladed cutters. Use of such standard tools avoids delays incident to design and production of special tools or blades, particularly under present conditions. At most, it is necessary only to cut off the shanks of such tools and perhaps re-grind the cutting edges to the desired cutting angles.

At Porter, the assembled tools are used largely for face milling cast iron machine parts, production being comparable to that encountered in job shops. The cutter bodies are made by Porter, and also finally assembled in the Company's tool room after grinding the "standard" tools to be used. For this purpose, the company uses a cutter grinder equipped with both silicon carbide and diamond wheels.

Shown in Fig. 1 are three of these multi-bladed cutters. The cutter at the left is used for face milling the ways of several types of machines. The face milling blades are produced from ½" square Style T-4 tools. A close-up of the operation on which this cutter is used is shown in Fig. 2.



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Portable Industrial Vacuum Cleaner

Cleans floors, walls, pipes, line shafting, boiler tops, — everything in mill, shop or factory. Sucks up dust, dirt, grindings, chips, etc. Cuts waste and maintenance expense, reduces fire hazards, promotes health and morale.

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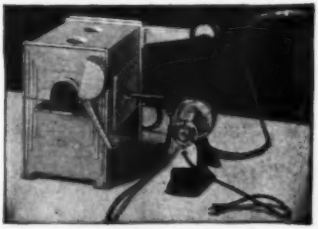
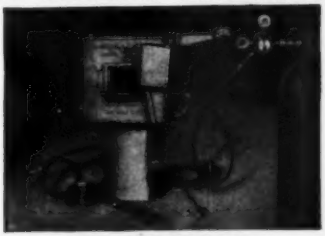
BRAZES CARBIDE TIPPED TOOLS SMALL PARTS EXPERIMENTAL WORK

HARDENING AND HYDROGEN BRAZING FURNACES



FEATURES OF No. 1

1. Just plug it in and operate, no installation costs.
2. Portable Burner.
3. 2350°F. in 15 minutes.
4. Operating cost, 7¢ per hour.
5. Silicon Carbide Muffle 7"x3 1/8"x2 1/8".
6. Available as a Hydrogen Brazing Furnace complete as illustrated.



FEATURES OF No. 2

1. Self contained unit, no installation costs.
2. Built in burners and blower.
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Write for descriptive literature and prices

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Originators of the American Bench Lathe
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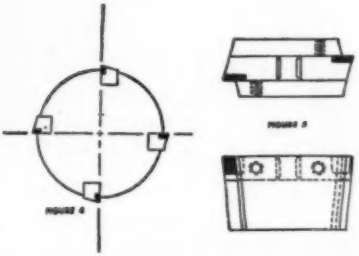
WALTHAM, MASS.

Prompt Deliveries

In the center (Fig. 1) is shown a combination milling cutter with special carbide tipped cutter in the middle, while the face milling blades are similar to those in the cutter at the left.

The combination milling cutters at the right in Fig. 1 are shown in operation in Fig. 3. Here, too, the face milling blades are Style T-4 ½" square standard tools, converted simply by cutting off part of the shank length, while the cutter in the center is carbide tipped by Porter by brazing on special tips.

"Standard" Carboloy tools are also used by Porter for lathe work on steel, cast iron, and bronze—single point tools being purchased as standards and reground if required for special shape work.



Along the same line of using standard tools to build up multiple-bladed cutters, Figures 4 and 5 show tools developed by other companies for reaming and boring. The tool in Fig. 4 is made up of four Style T-4 tools, placed in a bar for reaming cast iron.

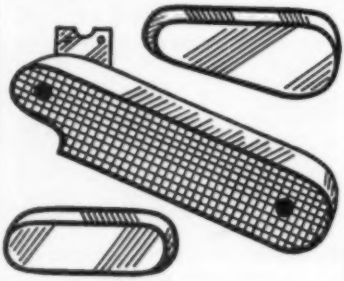
Fig. 5 shows a simple boring cutter produced by cutting off the shanks and grinding the tips of Style 7 tools, and mounting these in a boring head.

In addition to taking advantage of the 'mass-production' prices on the standard tools used, the idea is also effective in reducing the time required to obtain such tools, since most standard tools are carried continuously in stock.

Welded Forming Die Built

Both male and female members of this forming die for a steel press were built quickly and economically by arc welding together rolled and shaped pieces of plain carbon steel. The press converts hot 3/16" plate into the upper

WORK IN SAFETY

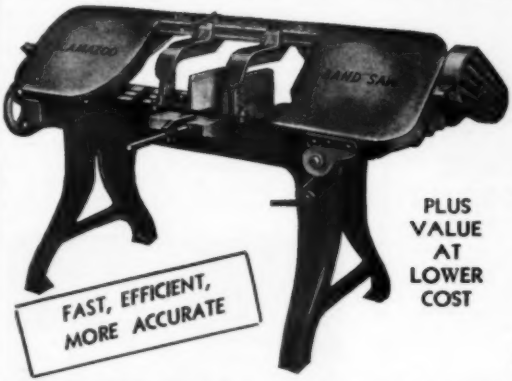


Gear and belt guards made of close plate, perforated metal or expanded metal. We design or manufacture to your specifications.

THAMES METAL WORKS, INC.

14-16-18 Hamilton St., New London, Conn.

NOW Is The Time To Get Your
KALAMAZOO METAL CUTTING BANDSAW



FAST, EFFICIENT, MORE ACCURATE

PLUS VALUE AT LOWER COST

- Hydraulic frame control
- Enclosed dirt-proof gearing sealed for life.
- Fully guarded moving parts.
- Automatic cut-off.
- Quick acting vise.

Send for complete descriptive material today.

KALAMAZOO T & S CO.

508 HARRISON STREET
KALAMAZOO, MICHIGAN

WANT TO SAVE TIME IN TOOL GRINDING?

Sellers 4T Tool Grinder

Manufacturers are saving many valuable man-minutes with the Sellers automatic method of duplicate tool grinding which produces and reproduces practically any straight or curvex form to exact specifications by following a template cam.

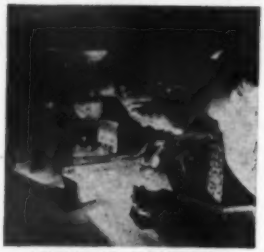
If you want to save time in tool grinding—and lower tool costs too—investigate Sellers Tool Grinders today.

William Sellers & Co., Incorporated
1616 Hamilton St., Philadelphia, Pa.

FOUNDED SELLERS 1848

Sellers

MAGIC Electro Welder



WELD IT YOURSELF

This handy, moderate size, useful welder, which sells for $35.00 is designed to handle odd small jobs that would otherwise tie up large expensive welders. Several located in your plant will save trips to the welding department. Easy To Use.

Will weld, braze or solder. Can be used for small butt, lap, or fillet welding. Welds fractures in cast iron; fills cracks and pits in bronze and aluminum castings and builds up bearings, gears, worn shafts, etc. Plugs into any 110 volt a. c. outlet. Guaranteed for one year.

Write for details.

Magic Electro Welder Mfg. Co.
239-241 CANAL ST., NEW YORK, N. Y.

radiator shell used on the LeTourneau Tournapull Tractor.

Both members were made of ¾" rolled plates. The male member also

involved pipe sections to form the rounded edges, with portions of machine ball for the spherical corners. After the parts were welded together, finishing was accomplished entirely by grinding, no machine work being required. It is pointed out that considerable time and cost is saved by this method of making dies and the die is much lighter and more easily handled. (Photograph courtesy Hobart Brothers Co., Troy, Ohio.)

Veteran Does Its Bit for Defense

In the year 1872, a 24" double-housing planer embodying the spiral gear drive invented by William Sellers in 1864, was manufactured in the shops

of William Sellers & Co., Inc., of Philadelphia. It was used in regular production from that time until 1923, the indication being that it was in active

use during the Spanish-American War and in the production period before, during and after the First World War. During the period following 1923, the records show little activity on its part.

In 1934, like many a man in his "sixties," it was retired. Because of its historic interest, it was placed on exhibition in the halls of the Franklin Institute, Philadelphia. Recently, the directors of the Franklin Institute, which is no mere repository or records, but an active force in the community, offered to help the Government on the defense program by handling machine work in their own well-equipped shops. On a job requiring the planing of precision instrument parts, the old planer was recalled. So it was put into operation again and is now doing its daily shift as regularly as in the days of President Grant and as accurately as the close tolerances of the present day require, showing no signs of its life span of almost 70 years.

Data Book on Power Assembly Tools

Black & Decker, Towson, Md., has just published another in its series of Handbooks—a 56-page Data Book on Power Assembly Tools:—Portable Electric Screw Drivers, Nut Runners and Tappers.

This book contains a wealth of information not only on Power Assembly Tools but valuable information as to sizes of pilot holes; bolt, nut, cap screw and lag screw sizes; socket wrenches; tap drill sizes, etc.

ARMOR
MILLING MACHINE
HYDRAULIC POWER FEED

Smoother action—faster production—countless table feeds—up to 8' per minute. The milling machine with the latest improvements to meet today's unprecedented demands.

Write for Bulletin 8J.

Aircraft Machinery Corp.
Burbank, California

TUNGSTEN CARBIDE LATHE and GRINDING CENTERS

Circle Tip Tool Company's Centers are equipped with a hard wear and gall resisting metal, lasting from 50 to 100 times as long as High Speed steels.

STANDARD CENTERS

Morse Taper	Price each
No. 1	$3.00
2	3.50
3	6.50
4	10.00
5	15.00
Brown & Sharpe Taper	
No. 7	$4.00
8	5.50
9	7.00
10	10.00
11	12.50
Jarno Taper	
No. 4	$3.00
5	3.25
6	4.00
7	5.00
8	6.50
9	7.00
10	9.00
11	10.00
12	11.00

Prices on Special Centers on Request

Write us for prices and catalog on Standard Tungsten Carbide Tip Tools.

CIRCLE TIP TOOL CO.
EAST ORANGE NEW JERSEY

ARMGLO

Manufacturers of Resistance Welders—Foot, Motor, Air and Hydraulic operated.

•

Standard and for specific applications with and without electric timing control.

•

Bench type filing and sawing machines and abrasive band finishing machines.

•

ARMGLO COMPANY
Milwaukee, Wisconsin

RIVET
The Noiseless Way

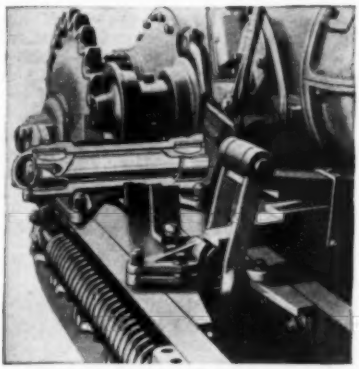
For high speed production, the GRANT noiseless spinning and vibrating hammer types are "tops".

Free samples — Write today.

The Grant Mfg. & Machine Co.
C. E. STATION - BRIDGEPORT, CONNECTICUT

New Mount for Tractor Pivot Axles

Few points on a tractor are subjected to wear and abrasion as is the pivot axle of the trucks. This axle, fastened to transmission, carries entire load of the trucks. The trucks, in turn, oscillate about this axle.



By taking the entire load and oscillating motion of the trucks of a track-type tractor, "Torflex" rubber-backed bearings manufactured by Harris Products Co., 5408 Commonwealth Ave., Detroit, are said to have eliminated necessity for pivot axle lubrication, reducing wear and stopping friction. As a result of the performance of these bearings, a prominent tractor maker is featuring the bearings in sales literature.

It is explained that with these bearings, oscillating motion of the trucks is absorbed by the rubber so there is no friction or wear and lubrication at this point is not required.

Two bearings are used for each truck —one at each end of the pivot bearing assembly. Accompanying illustration shows cut-a-way section of pivot axle indicating location of the bearings.

Jobs

As a result of the defense emergency, the U. S. Employment Service has made advances that might have taken ten years to achieve under ordinary circumstances. What these changes mean to the average worker seeking a defense job or an employer seeking skilled workers is described in detail in a pamphlet titled "Man Meets Job — How Uncle Sam Helps," published at ten cents by the Public Affairs Committee, 30 Rockefeller Plaza, New York City.

Written by Philip S. Broughton of the Social Security Board, the pamphlet points out that the U. S. Employment Service is no longer concerned with finding a job—any job—for the jobless man or woman. It must "meet defense job demands with the best skilled men and women available."

Workers seeking defense jobs are advised: (1) Register at once with your local state employment office, if you are qualified for work in a defense industry. (2) Register if you are doing semi-skilled or unskilled work and you have a higher skill. (3) Apply at the employment office if you want training for a defense job. (4) Do not leave your home town in search of work unless the local employment office tells you of a definite opening.

Employers are expected by the O. P. M. to use the U. S. Employment Service to fill their defense job needs. They are urged to: (1) Give their local state employment office a list of the job openings they now have and expect to have. (2) Give the requirements for each job by occupation and skill. (3) Give their employment office a chance to refer qualified workers before advertising. (4) Avoid soliciting workers competitively. Also avoid recruiting workers from outside your community.

NORGREN
Vitalizer **UNITS**

Pass your air power through a Norgren filter and it's as clean as the breeze atop Pikes Peak! The filter stops scale, other impurities, and excess moisture.

Then let the Norgren Lubricator vitalize every tool in your plant with a *controlled fog of oil*. There is no substitute for Norgren air tool lubrication.

Positive, continuous, regulated oil feed. You can't forget to turn it on; there's no need to turn it off! No working parts. Sight feed; you KNOW it is operating. No loss of air pressure passing thru the Lubricator.

Catalog 400. There's a Norgren air cleaning, oiling, and control assembly for every place air is used in industry.

C. A. NORGREN CO.
DENVER, COLORADO
236 Santa Fe Drive

THE PRECISION UNIVERSAL TOOL HEAD

brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machine or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, under-cuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

THE PRECISION TOOL COMPANY
P. O. BOX 155, BROOKLYN, NEW YORK

Cable Address: "Pretool-New York" Tel: MAin 4-1064

TANNEWITZ *High Speed*
METAL CUTTING BAND SAWS

Fastest and best known means of cutting sheet steel aluminum and magnesium sprues, gates, risers, and kindred items.

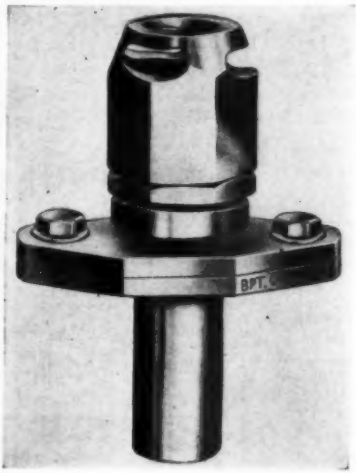
Provides sawblade travel of over 2-miles per minute with PERFECT SAFETY. Cuts are exceptionally smooth.

Write for Metal Cutting Band Saw Bulletin.

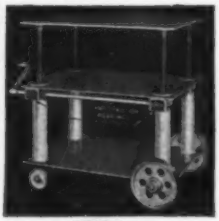
THE TANNEWITZ WORKS
GRAND RAPIDS, MICHIGAN

Alco Offers New Die Holder

Alco is now in production on a releasing model acorn type die holder for hand screw machines and turret lathes. It has the same adjustable concentric alignment feature as the model used for automatic screw machines.



It is claimed to be the only acorn type releasing model die holder with the adjustable concentric alignment feature and, because no pins are used, it is said to be the most rigid drive ever used in a releasing model. Old machines with badly worn turrets and



STYLE A

***The* HAMILTON PORTABLE ELEVATING TABLE—"PORTELVATOR"**

No strained backs or bruised fingers if you let the Hamilton "Portelvator" do the lifting for you.
Use it as means of support—Use it to level large overhanging pieces of work—Use it as a bench to work on—An economical and efficient helper—One to twenty ton hand or power operated.

Write for full details today.

THE HAMILTON TOOL COMPANY
Ninth and Hanover Streets, HAMILTON, OHIO

OLIVER DIE MAKING MACHINES

WILL SAVE YOU MONEY

Produce those rush jobs on time — Enable you to use less skilled labor.

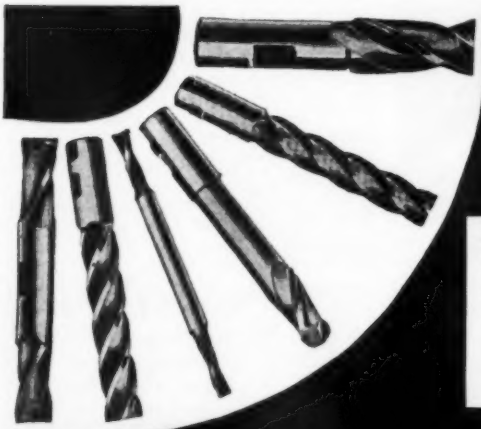
Save 50 to 60% of the labor on Dies, Gages, Cams, Stripper plates, etc., over hand methods.

PRICED AS LOW AS $125.00

SEND FOR LITERATURE

We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Tap Grinders, Point Thinners.

OLIVER INSTRUMENT CO., 1408 E. Maumee St., Adrian, Michigan



Shear Cut — High Speed

END MILLS

Shear Cut End Mills are offered in all standard sizes, single and double end.

Write for catalog and prices today.

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2345 WOLCOTT ST., FERNDALE, MICHIGAN

The
HAMILTON MUEHLMATT
Super Sensitive
DRILLING MACHINES

Customers on sending in repeat orders tell us, "We want your machine – it's 'tops!'". You, too, will find it "tops" on your small hole drilling where accuracy is essential. On instrument, aircraft, diesel, and any other type of precision drilling, the Hamilton-Muehlmatt Super Sensitive Drilling Machines have a recognized superiority in precision, sensitivity, and economy.

Send for complete details.

The Hamilton Tool Co.
Ninth and Hanover Sts. Hamilton, Ohio

Standard Since 1911

INCLINABLE POWER PRESSES

L & J PRESS CORP.
Successors to Lockbourn-Jordan Tool & Machine Co.
1825 STERLING AVE. ELKHART, INDIANA

bearings are asserted to produce acceptable work with this new tool.

A ground bearing surface in the nut contacts a similar ground surface on the body, assuring alignment of die regardless of thread fit. It provides for quick and positive set-up of die, concentric with the work. There are large openings for chip elimination and proper lubrication.

Dimension specifications and price list will be sent on request by The Alco Tool Co., 835 Housatonic Ave., Bridgeport, Conn.

Van Dorn Center-Drive Scrugun

Van Dorn in connection with its already popular Scrugun has developed the No. 8 Center-Drive Scrugun.

This tool is especially suitable for operation in a suspended position. Its center spindle improves "aim", the bonnet grip or paddle switch arrangement eliminates handles, and it will operate in reverse at full power when equipped with reversing switch. It is available with either positive or adjustable clutch, and with either bonnet grip and toggle switch or paddle switch.

It will drive wood screws up to No. 10x2"; self-tapping screws up to No. 12, and machine screws and nuts up to ¼" diameter. The no-load speed is 750 r.p.m.; optional speeds available at no extra charge are 500, 1000, and 1250 r.p.m.

Full details may be obtained from The Van Dorn Electric Tool Co., Towson, Maryland.

NUMBERALL
Numbering Machines
Automatic and Hand Operated
for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.
For Marking Metal Parts, Name Plates, Metal Checks, etc.
Write for Catalog.
NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, - - - Staten Island, N. Y.

Accidents

Out of Cleveland comes the revelation that four out of five traffic accidents are occurring to workers going to and from defense jobs. Such a situation—and it may well be assumed that it exists in most defense industry areas — should command the immediate attention of every plant management engaged in defense work, of every community in which defense work is going on, and of every individual located in these areas. America's national defense program cannot afford to sacrifice a single worker — skilled, semi - skilled or unskilled—least of all to such a needless cause as highway accidents. Special measures for control of this new problem are urgently needed—the program developed by Cleveland suggests a few pointers. Says Mr. Elliot Ness, Safety Director in Cleveland, as reported in a publication of the American Mutual Liability Insurance Co. of Boston:

"It was found that 80% of all those arrested for violations or involved in accidents were employed in industries particularly engaged in defense work.

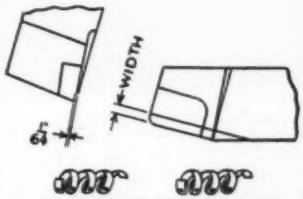
"We sought the cooperation of employers individually and through employers' groups and we also sought the aid of leaders of unions having large memberships in defense industries.

"Police officers give talks emphasizing the necessity for careful driving. Perhaps the most effective method is the notification card sent by the Greater Cleveland Safety Council to the employers of all persons arrested for a traffic violation.

"As a general rule the card is turned over to the employee's foreman or immediate superior."

Recommended Widths for Parallel Chip Breakers on Carbide Tipped Steel-Cutting Tools . . . .

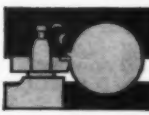
Standard KENNAMETAL tips are now shipped within 3 to 4 days upon receipt of order; standard and modified standard tools within 10 days. In cases of unusually large orders, partial shipments are made within the above times.



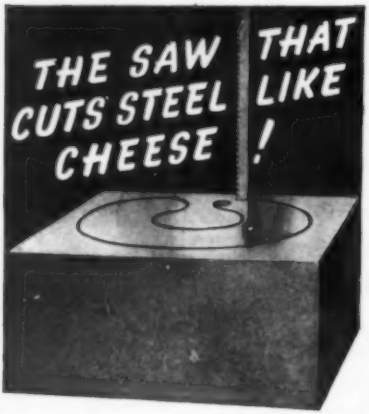
DEPTH OF CUT	FEEDS			
	.006-.012	0.13-.017	018-.027	.028-.035
1/64" to 3/64"	1/16	5/64	7/64	1/8
1/16 to 1/4	3/32	1/8	5/32-11/64	3/16
5/16 to 1/2	1/8	5/32	3/16-13/64	7/32
9/16 to 3/4	5/32	3/16	7/32-15/64	1/4

Depth of Chipbreaker—1/64" maximum

Write for Catalog No. 41 listing specifications and prices for standard KENNAMETAL tools and blanks.



McKENNA METALS Co.
135 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.



This saw is cutting the toughest stuff in the shop —die steel 10" thick. It will cut any material— armor plate, plastics, etc., as smoothly as cheese.

Q. What is remarkable about the cut?
A. The kerf is curved, following layout line, with minimum radii 3/16" and corners notched *point clean.*

Q. What saw does this?
A. Milford PROFILE SAW.

Q. Is a special machine necessary?
A. No. Many makes of "contour-sawing" machines are in use, but any good jig or band saw machine with fixtures will do this class of cutting if provided with the proper saw. THE SAW DOES THE CUTTING, NOT THE MACHINE.

Q. Does profile saw have to be good?
A. It has to be "perfect" — in design, in steel, in milling, in heat treatment and in scores of other ways to withstand extraordinary working stresses, since saw as narrow as 1/16" is used. Milford PROFILE SAW is remarkably durable.

Q. Who originated profile saw?
A. Milford, the world's largest producer of metal-cutting band saw, with more than 50 years experience making this difficult product.

Q. How is Milford PROFILE SAW handled?
A. It is packed in 100' coils, magazine-boxed. Various sizes are stocked by mill supply houses in all localities.

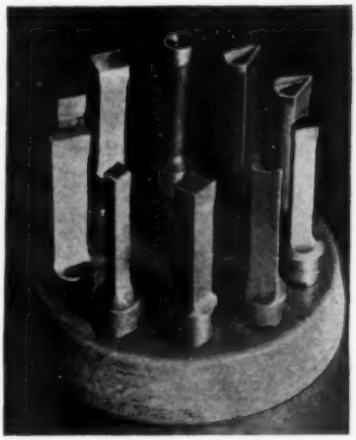
WRITE FOR FREE SAMPLE, GIVING SPECIFICATIONS OF SAW YOU NOW USE, AND MAKE OF MACHINE

THE HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.

MILFORD
PROFILE SAW
REZISTOR HACKSAW BLADES

Tools for the Slotmaster

An assortment of 10 high speed steel slotting tools is announced by Experimental Tool & Die Co., 12605 Greiner, Detroit.



A new edition of a 4-page catalog describes these accessories for the Universal Slotmaster—a slotting head that can be used on all milling machines, providing double duty facilities. This attachment may be used as a vertical or horizontal slotter and shaper for cutting key-ways, templates, splines, internal gears, and for slotting out precision blanking dies and molds, or wherever sharp corners and special shapes are machined.

It is operated over the milling machine table and requires but little time to change over from one head to the other and back again.

Rust-Proof Finish—Black on Copper

Alrose Chemical Co., Providence, R.I., originator of the Jetal process for blackening iron and steel, announces a new Electro-Jetal process, giving a black rust-proof finish on copper by anodic oxidation. Any metal that can

COLMONOY FURNACE WELDING for HIGH PRODUCTION PARTS—

Such as Centerless Grinder Rests

This method consists of applying a casting of COLMONOY NO. 6 alloy to a steel base, by a furnace bonding process requiring no additional bonding material. One of the advantages of this process is its adaptability to high production parts, or intricate parts inaccessible for torch application.

COLMONOY NO. 6 is effecting substantial savings on machine tool parts subject to great wear and abrasion—lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, forming and drawing edges, etc.

COLMONOY may be cast or applied as an overlay, using gas or electric welding equipment.

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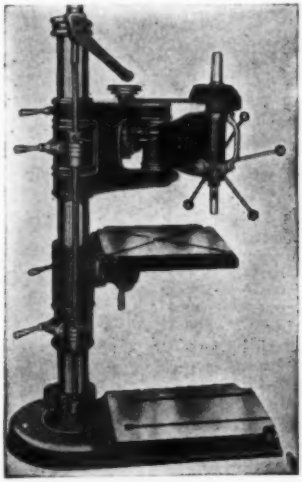


MAKE YOUR DRILLING JOBS EASIER

Increase Profits . . . Speed-up Production
End Worker Fatigue . . . Increase Efficiency
by using this

DRILLMASTER RADIAL DRILL

Economical in operating and first cost, this floor type, heavy duty, precicion-made, well-balanced Radial offers many features that merit your careful consideration. Drilling to the center of a 36" circle, No. 2 Morse Taper and heavy duty ½ HP ball bearing motor. The full floating, ball bearing spindle assures free and sensitive operation at all speeds.

Send TODAY for bulletin giving full details.

Wm. C. Johnson & Sons Machinery Company
St. Louis, Missouri

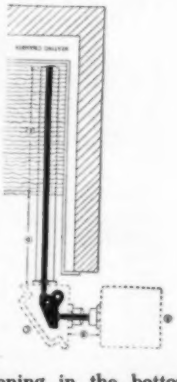
Kipp Air Grinder
SPEED UP TOOL ROOM PRODUCTION
Kipp Air Tools give you highest speeds, lowest prices and have proved indispensable in thousands of tool rooms and production departments. Free trial permits any concern with a satisfactory credit rating to try any Kipp Air Tool for ten days. Grinders sell from $9.75 to $58.75. Chippers and Filers at $19.75. The BB Grinder illustrated is only..... $25
FREE TRIAL
FREE CATALOG
Send Kipp Air Grinder Model BB on your 10 day Free Trial Offer.
Send the new Kipp Air Tool Catalog.
Name.....
Company.....
Address.....
MADISON-KIPP CORP.
207 WAUBESA ST., MADISON, WIS., U.S.A.

be copper plated can be blackened by Electro-Jetalizing. After preplating with copper, products are immersed in a special electrolytic oxidizing bath for 2 to 5 minutes. The resulting velvety black surface of Electro-Jetal is said to be an excellent absorptive base for an after-treatment of oil, wax or lacquer which gives a non-porous, rust-proof finish equivalent to ordinary nickle plate.

The new bath can be operated at any temperature below the boiling point of water, using ordinary steel containers, heated by steam coil. Work can be oxidized on racks, in bulk or baskets. The chemical cost, exclusive of the copper plate, is said to approximate 25c per thousand square feet of surface. The process is now being used industrially. One firm alone is so treating over 260,000 small parts per day. Samples to illustrate the finish will be furnished on request.

Temperature Control Angle Fitting

Secure attachment of a perpendicular temperature control instrument to a heating container in such a way as to keep the tube of the instrument as close to the side walls of the pot as possible — that's the purpose of a unique device developed by the Burling Instrument Co.



It consists of a hollow casting containing a very perfectly designed fulcrum device, one end being in exact alignment with an opening in the bottom of the fitting and the other part in alignment to an opening in the side.

Into the bottom outlet is screwed the

HALLOWELL

DeLuxe STEEL FOREMAN'S DESK

NEW! USEFUL!

Popular in every corner of the shop, this natty "Hallowell" Desk—one of several styles and models—fills a multitude of needs.

Fig. 1740

A wide variety of standard and interchangeable drawer, cabinet, shelf and top units provide combinations to meet all requirements for the orderly safekeeping of records, blueprints, forms, etc.

"Hallowell" Foreman's Desk with drawer and enclosed cabinet. Compartments and drawer at top. Shipped knocked down.

You'll like the prices, too . . . write for details *today!*

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. DEPT. 559

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BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

"ALL OUT" ★ ★ ★ with ALCO

FOR every drilling, tapping, reaming, and thread cutting requirement. • *The new* ALCO DRILL CHUCK *will help you maintain maximum production schedules.* • *No bushings are required,* which saves set-up time — eliminates bushing costs — stops the delays of waiting for new size bushings to be made. It holds the drill firmly and securely • Its exclusive floating feature assures *positive concentric alignment* — is quickly adjusted by means of two studs — will fit old, worn machines as well as newest models.

ALCO DRILL CHUCK

Write for dimension specifications and prices — Order now for prompt deliveries —

THE ALCO TOOL COMPANY

835 HOUSATONIC AVE., BRIDGEPORT, CONN.

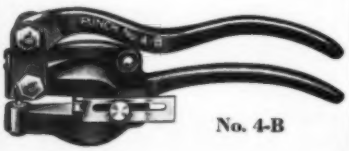
Detroit Office: 908 Stephenson Bldg.

ALCO EFFICIENT TOOLS

2 DAYS' PRODUCTION IN 1

Because of their power and capacity range, simple construction and fine balance, the W. A. Whitney punches will enable you to do more work than heretofore.

There's a type and size for every requirement.



No. 4-B

Tinners No. 4-B shown above punches ¼" hole in 16 gauge iron. No. 6 Skylight Ventilating and Tank Flange model, shown below, punches ¼" hole through 3/16" iron.

No. 6

Let us send you our catalog.

W. A. WHITNEY MFG. CO.

ROCKFORD, ILLINOIS

lower tube of the instrument, namely—the active or sensitive part of the tube and into the side opening the extension tube, its other end being attached to the instrument head.

It is balanced so that the slightest contraction or expansion of the tube in the heated media, instantly actuates the lever in the ell fitting which in turn continues the proper expansion or contraction movement to the upper or main working control parts of the instrument.

It is possible to have the switch of the control in any desired position around the heating pot or vessel without taking up any more than 1" space from edge of pot to outside of tube.

M. & H. Hose Reels

A new line of Hose Reels, that have been under development and test for several years, is now being manufactured by the M. & H. Hose Reel Co., 5204 Alhambra Ave., Los Angeles, Cal.

These modern hose reels employ a unique method of turning the reel for re-winding the hose. A coil spring enclosed in a cylinder actuates the reel through a gear drive. For extra long lengths of hose, the reels can be operated by air by using a piston instead of the coil spring. A patented self-sealing ball bearing swing joint is incorporated in the design to eliminate the packing gland problem.

These reels have many applications in manufacturing plants, machine shops, garages, etc., for such services as, blow guns, air tools, air hoists, high pressure greasing, liquid dispensing, paint spraying, gas welding, etc.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

Write for Circular

NIELSEN TOOL & DIE COMPANY
1859 Gardner Ave.
Berkley, Mich.

Gliders

Since the battle of Crete, public interest in the military use of gliders has increased sharply. Twelve army air officers have recently completed courses in gliding, although the army declares that it has been studying the possibilities of gliders for some time.

An even more important use of gliders, however, is in the training of potential pilots, according to a public statement by Commander E. F. McDonald, Jr., President of Zenith Radio Corp. and long an advocate of vastly increasing the number of our gliders, glider clubs, and amateur soarers.

Commander McDonald declares that glider training is very important to our national defense effort. Glider training teaches a man to get maximum efficiency from his ship and develops a type of precision flying that few power pilots ever learn. It also is said to offer a remarkable economy in training time. Every moment in the air in a glider is spent in actual flying, while the power student spends a large portion of his air hours in level flight, with the ship practically flying itself.

Gliding would fill the gap between the time boys stop playing with model airplanes and their enrollment in flying schools. Properly organized and led, gliding is within the financial limits of most boys, it is claimed. Commander McDonald believes that the government should furnish instructors and subsidize the manufacture of gliders for such boys. He points out that it would cost little compared to what the government is spending on other phases of its aviation program.

Germany has a reservoir of over 250,000 glider pilots from which to draw potential Lutwaffe pilots.

7 points TO SPEED YOUR SURFACE GRINDING

PLUS FEATURES OF FAR HIGHER PRICED MACHINES!

COVEL NO. 15
6" x 18"
Hand Feed
SURFACE GRINDER
available for early delivery to defense industries

★ ★ ★

Get these "Seven Points" Write, wire or phone for Bulletin 440 and name of your COVEL Dealer.

COVEL INDUSTRIAL GRINDERS
COVEL MFG. CO., BENTON HARBOR, MICH.
Grinding Machinery Since 1874

Cabinet Pedestal For Bench Type Drill Grinder

William Sellers & Co., Inc., 1616 Hamilton St., Philadelphia, have developed a suitable pedestal of cabinet type with work space approximately 13" wide by 30" long on which their drill grinder may be mounted for easy operation.

The pedestal is approximately 31" from floor line to top.

The main pedestal is constructed of sheet steel of sufficient weight and ample bracing to form a vibrationless mount for the machine. A steel door on hinges and with fastener is placed in front to allow convenient means for storing attachments and supplies for the machine on at least three shelves.

Top and shelves are of suitable material, preferably wood, to absorb vibration and to avoid defacing tools and attachments when handling.

The top is so constructed that the base level of the machine may be raised by the simple addition of a block under the machine for the convenience of tall operators.

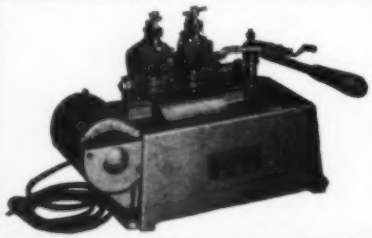
Weight of pedestal is approximately 175 lbs. Finish is in machine tool gray.

Books for the Defense Program

Bulletins on new books for the defense program are announced by the Chemical Publishing Co., Inc., 238 King St., Brooklyn, N. Y. A large number of these new titles are directly in the machine tool field. There are volumes on lathework, milling practice, drilling and grinding, gears and gear cutting, and sheet metal work.

Aircraft work receives considerable attention. Titles in this field include a useful "Glossary of Aeronautical Terms" and "Aircraft Production."

Other works offered range from some of general application such as "Fitting Practice" to such specialized subjects as "Cables and Wires" and "Diesel Engine Operation."



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC., 7225 McDONALD AVE., DETROIT, MICH.

Jigs

"Jigs, Tools, and Fixtures," by Philip Gates, is announced by the Chemical Publishing Co., Brooklyn, N. Y. Published at $4.00, this 209-page volume is the second and enlarged edition.

This new work covers the drawing and design of jigs, tools, and fixtures for virtually all modern machine tools, with chapters on special equipment and drafting room procedure.

The author is a production engineer who formerly lectured at Aylesbury Technical School.

The opening chapters outline mechanical drawing and sketching—a valuable "refresher" to men whose knowledge of drafting is weak.

"First Considerations in the Design of Jigs, Tools, and Fixtures" is a valuable chapter to the beginner and of great interest to the general reader. The author then enters directly into the consideration of specific subjects.

An entire chapter is devoted to drill jigs. Milling fixtures are then treated with special emphasis on choice of machine, setting spots, and indexing fixtures.

Considerable space is devoted to chucks and related turning equipment such as mandrels, collets, indexing fixtures, tool holders, tap holders, shaving tools, etc. The subject of cutters is covered rather extensively with descriptions of inserted tooth cutters, relieved form cutters, hollow mills, reamers, broaches, etc.

The remainder of the book is devoted to such subjects as screw-cutting tools, gauges, press tools, and magnetic and pneumatic gripping. A chapter covers jig and tool office procedure.

• Your lubrication problems, whether large or small, will find the correct answer in the Gits Line. If your requirements are of special nature, send us your specifications.

GITS BROS. MFG. CO.

1860 South Kilbourn Ave. Chicago, Ill.

30 years of oil cup experience

New VERTICAL HEAD for VERNON #0 MILL
8½
Fully Universal. Operates freely at any angle—in any plane. Maximum distance, collet end of spindle to table top, 8½". For the most complete Miller in the low priced field, get the Vernon.
Don't wait for a big machine to do a small job — Prompt Deliveries on the VERNON LINE.
WRITE FOR ILLUSTRATED BULLETIN TODAY!
MACHINERY MANUFACTURING COMPANY
1918 E. 51 St. Vernon Los Angeles, California
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS & JIG BORERS, 11" SHAPERS & GRINDERS

Handy "Magic Welder"

A moderate sized but useful "Magic Welder" is offered by Magic Electro Welder Mfg. Co., 239 Canal, New York, N. Y. This inexpensive outfit should prove helpful in manufacturing plants of many types and sizes. It will handle miscellaneous small jobs which might otherwise tie up large, expensive welders. Several strategically located in a large plant should save trips to the welding department.

The Magic Welder is designed to weld, braze, or solder. It can be used for small butt, lap, or fillet welding. According to the makers, it welds fractures in cast iron; fills cracks and pits in bronze and aluminum castings, and builds up bearings, gears, worn shafts, etc. No special wiring is needed as it plugs into any 110 volt a.c. outlet.

Production Expands Grinder Line

Production Machine Co., Greenfield, Mass., announces that it has taken over manufacture of the line of Plain and Universal Tool and Cutter Grinders formerly manufactured by Greenfield Tap and Die Corp., and are building these machines in three types:—No. 190—the lightest; No. 2—standard machine with countershaft drive and No. 3—the new Motor-in-Head Grinder.

These machines with the various attachments which are available, cover practically every tool room requirement and will be found useful for much production work. Company is now scheduling orders for early fall delivery.

"Worm" Designation Dropped For Cone-Drives

To eliminate misunderstandings, the designation of "worm gearing" in connection with its double-enveloping Cone-Drive type of gearing is being dropped, in future, according to an announcement by Michigan Tool Co.

Technically — while the normally driving member of a Cone-Drive gearset has the same general shape, usually, as an hour-glass worm—the gearing itself differs from worm gearing in the same proportion as worm gearing is differentiated from helical gearing.

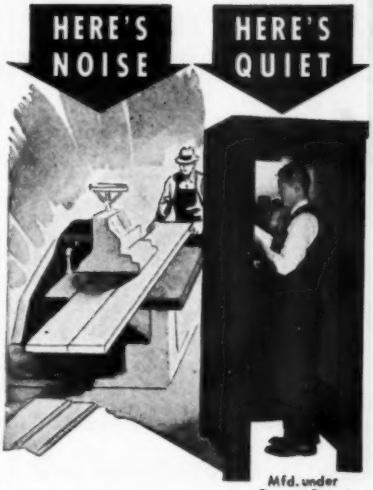
The differentiation, basically, is that helical gearing is "non-enveloping," worm gearing is "single-enveloping," while a Cone-Drive gearset is "double enveloping"—both driving and driven members enveloping each other, resulting in an entirely different set of contact and operating conditions than those characterizing conventional worm gearing. To this double enveloping design is attributed the fact that Cone-Drive gearing has a greater load carrying capacity than worm gearing, just as worm gearing has a larger load capacity, normally, than helical gearing.

The announcement includes a change in name from the former "Cone Worm Gear Division" of Michigan Tool Co. to "Cone-Drive Division."

Century Explosion Proof Motor

Century Electric offers a new motor, contructed to meet the specifications and carry the label of Underwriters' Laboratories, Inc., for Class 1, Group D installations—where the surrounding atmosphere is charged with explosive quantities of acetone, alcohols, gasoline, lacquer, naphtha, natural gas, petroleum, or solvent vapor.

The motor is constructed so it will resist the pressure of an explosion of any of these gases should one occur inside the motor and not cause an explosion in a similar atmosphere outside the motor.



A Quiet Place to Telephone Even in the Noisiest Shop

If you have trouble hearing on your shop phones because of noise, install a Burgess Acousti-Booth. This remarkable booth gives you a "zone of quiet" that makes telephoning easy. Patented, sound-absorbent walls soak up all factory noise. There are no doors because no doors are needed.

Hundreds of these doorless booths are in daily use in all kinds of factories. Easy to keep clean—no maintenance. Send the coupon below for illustrated bulletin and prices.

Mail Coupon for Free Booklet

Burgess Battery Company, Acoustic Division
520 W. Huron St., Chicago

Please send Free booklet describing Burgess Doorless Acousti-Booth and how it makes telephoning easy in noisy places.

Name----------

Firm Name----------

Street-City----------

BURGESS ACOUSTI-BOOTH

MODEL NO. 16 "SPECIAL"

Constructed as per Specifications of U. S. Naval Aircraft Factories

Reg. U. S. Pat. Off.

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

Beware of Imitations! Our machine carries the Butterfly trade mark.

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model No. L—12" Table.

HARVEY MANUFACTURING CORP.
161 Grand St., New York
Phone: CAnal 6-5170

Cutting and Grinding Compounds

A new 20-page booklet concisely reviewing 53 different formulas for machining ferrous and non-ferrous metals with specially designed Oakite cutting lubricants and grinding coolants has just been issued by Oakite Products, Inc., 57 Thames St., New York, N. Y.

The formulas cover a wide range of machining operations, such as light broaching, drilling and reaming, planing, slotting, shaping, wet grinding, cold sawing, and light threading and tapping.

The booklet also gives considerable data on several related subjects. Included among these are drawing and stamping compounds, rust-proofing iron and steel parts between manufacturing operations, cleaning and disinfecting cutting and grinding solution tanks and lines, lubrication of certain metal parts before succeeding operations, and preparing surfaces of steel products for black finishing processes.

BURKE

MILLING MACHINES

Make Fast Work of Small Jobs

Motor Driven

Timken roller or ball bearings to spindle

Write today for circulars.

Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio

—GEARS—

Spur—Helical—Worm—Bevel—Miter, Etc.

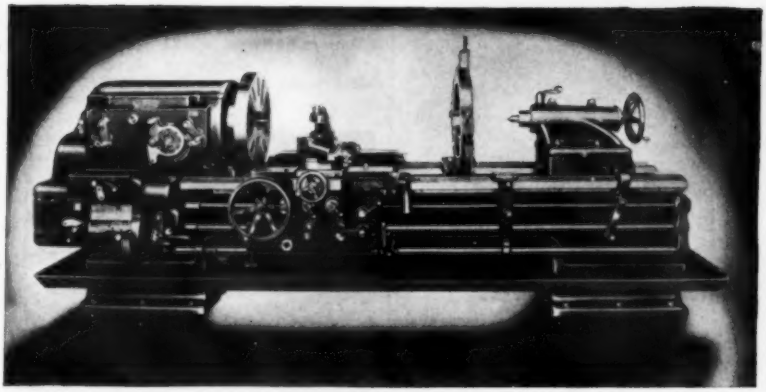
We do broaching and all kinds of grinding.

We specialize in grinding hardened steel bushings, cam rollers, etc.

Prompt service and quality has retained a large list of customers for 25 years.

TAYLOR MACHINE CO.
1919 E. 61st St., Cleveland, Ohio

Sidney Herringbone Geared Head Lathes



An attractive new loose leaf catalog presents the numerous lathe models offered by The Sidney Machine Tool Co., Sidney, Ohio. Of these, the 24 and 27" 16-speed Heavy Duty Lathes are typical, featuring the characteristic 16-speed continuous tooth herringbone geared headstocks. This headstock design provides 16 selective spindle speed changes (standard range — 5 to 306 r.p.m.—optional, 9 to 550) with gears that are in constant mesh. Speed changes are accomplished by the engagement of sliding clutches operating on multiple spline shafts.

Spindle and intermediate shafts are provided with center bearings. The forged, alloy steel spindle is mounted on Timken precision bearings which absorb both radial and thrust loads. Filtered oil is supplied to all gears and bearings by rotary pump in headstock.

The double wall apron supports both ends of the ground shafts on which the alloy gears are carried. Rack pinion has extra wide face. Rack pinion and all shafts are anti-friction mounted. Snap levers actuating serrated tooth clutches control longitudinal and cross feeds. An interlock prevents engagement of threading and feeding mechanism at the same time.

The quick change gear box provides 48 changes of feeds from .003 to .207" per revolution of spindle and 48 changes

This full capacity, industrial ½" Drill is handier, more powerful and an all-around better drill than many costing a third more. Specially wound high torque, forced-air cooled motor. Improved "natural grip" end and breastplate handle applies thrust directly behind drill point—and all quality features—oilless bearings, streamlined die cast case, etc., etc.

SPEEDWAY MFG. CO. 1822 S. 52nd Ave., Cicero, Ill.

Holding pressed metal parts for spot welding

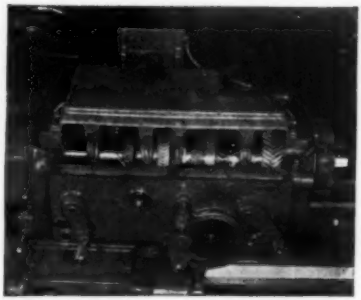
DE - STA - CO *Toggle Pliers* *Have Many Uses*

Welding must be swift and sure; and the welding operator is entitled to the best tools that can be supplied. Here is shown a welding operation in which De - Sta - Co portable Toggle Pliers are used to clamp the parts in place.

De-Sta-Co has quick-acting Toggle Pliers, or Toggle Clamps, suited to clamp parts during many manufacturing operations . . . Send for Catalog No. 40, which shows photographs of clamp uses.

DETROIT STAMPING CO.
Established Over 25 Years
347 Midland Ave • Detroit, Mich.

of threads from ¾ to 46 per inch, without need for additional loose gears. Provision is made though, in end gear train to mount additional change gears or compounds to obtain special threads or feeds not shown on direct reading index plate on front of gear box.



The rugged four wall bed has cross girts at 24" intervals. Cross feed and compound screws each have adjustable compensating nuts and large micrometer dials.

Many additional features of interest are presented in the catalog.

"Facts for Foundrymen"

The fourth edition of "Facts for Foundrymen" is announced by the Niagara Falls Smelting & Refining Corp., Buffalo, N. Y. Just published at $1.00, this pocket size manual contains information on aluminum alloys, fluxing alloys, fluxes, hardeners, intermediate and special alloys.

Hobart Welding Bulletin

A new booklet by Hobart Bros. Co., Troy, Ohio, gives many interesting glimpses of the varied ways in which "Simplified" arc welding is speeding production. Manufacturing large pieces, constructing ships of all types, fabricating building, and constructing pipe lines are but some of the many uses of welding depicted.

Seam and Spot Welding Technique

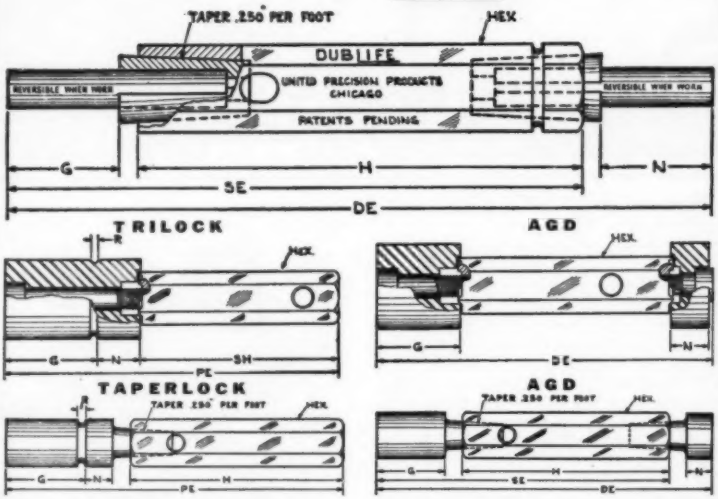
Useful information on the technique of seam and spot welding is given in a new 4-page leaflet announced by Westinghouse.

Factors affecting pressure, current, and timing are discussed with special emphasis on time of current flow. Synchronous and non-synchronous control applications are treated with recommendations for the proper use of each system.

Specifications for aluminum and brass welding are given. Tables list data on seam welding of mild pickled and oiled steel, spot and projection welding.

A copy of descriptive data 18-333 may be obtained from department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The New **DUBLIFE** *Gauges*



United Precision Products, exclusive manufacturers of Plug Gauges, announce a new improved DUBLIFE Gauge. The handle is made of hexagon material with bronze tapered collet which locks around the plug as it is driven into the handle. The plugs are reversible, so that when one end is worn the other end can be used, thus giving double life. We carry in stock, gauges from .030" to 1.5".

A new catalog showing DUBLIFE and AGD Gauges will be sent to those requesting it on company letterhead.

UNITED PRECISION PRODUCTS CO.

4618 W. HURON ST., CHICAGO, ILLINOIS

Rapid Production of Small Parts
Nilson Foot and Power Presses

For greater production on a variety of light work, here is a lighter and more efficient press. Pedal is accurately balanced and with an easy swinging motion, an effective blow is easily produced.

These Presses are designed for rapid production of small parts. The operator is relieved of actual labor and his work is merely control of a semi-automatic machine.

Safety clutch is provided which absolutely prevents repeating, regardless of whether or not the treadle is released. By turning a handle the press is instantly converted into a continuously running machine.

Our No. B O Foot Press and No. B 2 Power Press are shown. We also manufacture a No. B 3 Power Press which is larger and more powerful. Our Power Presses can be equipped with toggle feed, dial feed, or wire straightener and former.

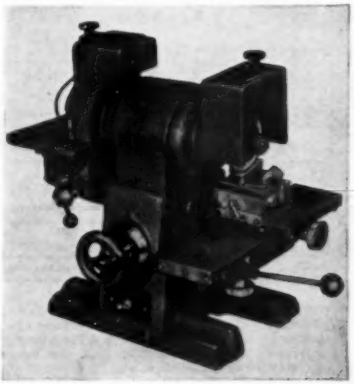
Let us send you complete details.

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

Hammond "4" Chip-Breaker Grinder

A new machine for grinding chip-breaker grooves in Carbide Tools with a 4" peripheral diamond wheel and built around a new-type universal-angle tool vise designed to give greater accuracy and convenience, is offered by Hammond Machinery Builders, Inc., 1614 Douglas Ave., Kalamazoo, Mich.

A new tool vise provides three separate planes of adjustment in setting grinding angle. Each plane is adjusted by accurately scaled readings. The vise consists of two closely machined steel blocks rounded on bottom, cradled into each other at right angles and "frozen" together after adjustment by means of cam locks operating in machined segments located on ends of respective blocks. Mounted atop these two blocks is a flat, circular piece which swivels 90 degrees from center of any of four sides of block below. This piece carries the vise jaws, holding tools firmly by means of Allen screws.



After tool has been mounted in vise, adjusted to desired grinding angle and locked into a solid, non-deflecting block, the entire unit is cranked upward into contact with grinding wheel

Join The Chain Making Gang
Nilson Chain Making Machines

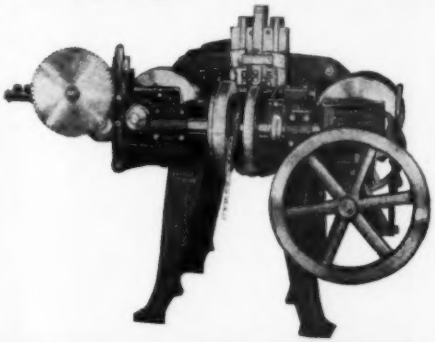
To make a full line of standard size chains as known to the trade, Nilson makes the four necessary sizes of machines. The chains made by these machines are strong, durable, safe and flexible.

The most important feature of the chains made by these machines is that ends are tucked in, making them perfectly smooth on both sides, and increasing the tensile strength 20%.

These chains are smooth to handle and will run through the hands without injury. They will run accurately on sprockets for conveyors or power transmission purposes.

We also make machines for forming the straight welded chain, for twisting the chain, and for forming the cross chain and hook.

Send for our bulletin today.



The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

by a few revolutions of the calibrated hand wheel.

Vise is mounted onto reciprocating table below, and cross-feeds in and out from base of machine by means of a calibrated hand wheel. With tool in grinding position, table carrying vise reciprocates at right angles to base of machine, actuated by lever directly below, to accomplish desired grooving of Carbide Tool. For wet grinding, a coolant tank is mounted over the wheel with flow controlled by a needle valve.

The grinding assembly on left side of machine may be used for rough or finish grinding of Carbide Tools, using a 6" Silicon Carbide or Diamond Cup wheel mounted on machine's left hand spindle. Over wheel is mounted an integral wheel guard and coolant tank with needle valve. A tilting work table, slotted for protractor angle-guide and fitted with easily cleaned sludge pan underneath, is mounted on a heavy 1-¾" machined shaft extending from left side of base. To change wheels, the entire unit may be slid easily off supporting shaft by loosening one clamp.

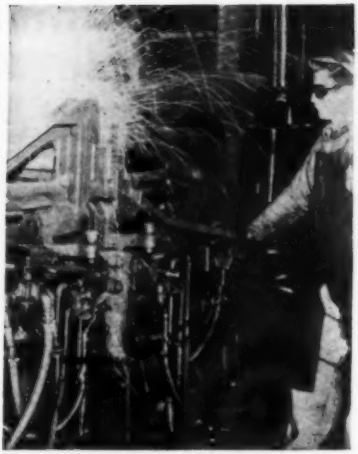
Power is supplied by a ball-bearing, ½ h.p. motor, of heavy-duty reversible type permitting right or left hand grinding, developing 3450 r.p.m. Unit is furnished either as bench or floor model and is described in Bulletin GP-5.

Substituting for Tungsten

In line with the impending shortage of Tungsten, great interest is being given the partial substitution of Molybdenum High Speed Steels for Tungsten High Speed Steels.

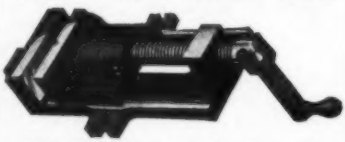
Along with this current development, three interesting folders have just been issued by Crucible Steel Co., of America, 405 Lexington Ave., New York describing three Molybdenum grades with which plants can maintain production. Each folder contains complete heat treating data for that particular grade.

Part of a battery of new Ex-Cell-O Thread Grinders in the new Greenfield Tap & Die Corp., plant at Greenfield, Mass.



Flash welding scenes like this are a familiar sight in many defense industries today. In this case, the operators eyes are protected by goggles fitted with non-shattering Tulca lenses, which are said to be particularly resistant to pitting. Tulca lenses are a recent development of the Univis Lens Co., Dayton, Ohio.

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

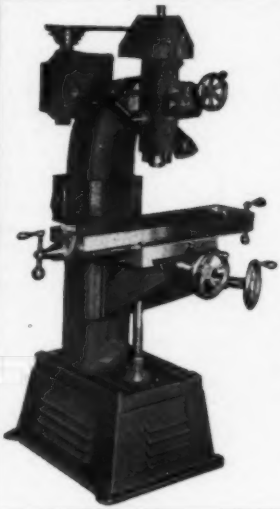
Veelos Belting Catalog

A new piece of literature on Veelos Adjustable V-Belting has been issued by Manheim Mfg. & Belting Co., Manheim, Pa. It is called the Veelos Picturegraph, and shows by means of pictures almost entirely, the educational ideas involved in the presentation of the Veelos line of belting.

MODERNIZE PRESENT EQUIPMENT

Russell Boring Bar bores 9/16" to 12" dia. with boring axis parallel to shank axis. One compact tool, with micrometer adjustment.

RUSSELL BORING BAR CO.
Middletown, Ohio



ABSOLUTELY!

WE CAN MAKE QUICK DELIVERIES

On our JACKSON Vertical and Horizontal High Speed

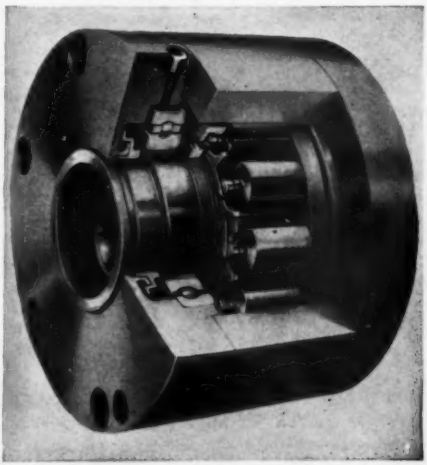
MILLING MACHINES

A new plant with increased facilities has made it possible for us to accept a limited number of orders for prompt shipment. High Grade in every respect and especially designed for High Speed Precision and Production Milling and Boring.

Wire, Phone or Write

Jackson Machine & Tool Company Sales Division
JACKSON, MICHIGAN

Indexing and Free-Wheeling Clutches



The Morse Indexing and Free-Wheeling Clutch, is in effect, a self-contained ratchet of an infinite number of teeth and is particularly suited to use as a ratchet for various feed mechanisms. It provides positive, dependable indexing control for practically every type of ratcheting operation. The uniform and accurate ability of this clutch in indexing loads down to minute limitations is asserted to permit a higher rate of speed, which in turn results in a considerable increase in machine production. It is emphasized that this uniform indexing control provides closer and more punching per given stock and means less scrappage. Varying speeds and index strokes to accommodate various stocks is accomplished by one machine adjustment. The design is compact, construction is rugged, and operation simple. Power is transmitted from an inner hub or driver member by a system of positively gear

SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½° by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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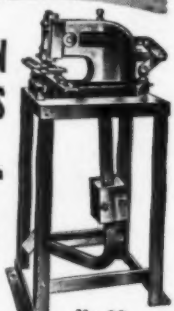
112 Webster St., Dayton, Ohio

BUY WHITNEY-JENSEN
METAL-WORKING MACHINERY and HAND TOOLS
for LONG LIFE and ACCURACY

TOGGLE-ACTION FOOT PRESSES



No. 28 Foot Press

MORE WORK with LESS EFFORT!

A powerful linkage MULTIPLIES your foot power, for fast, EASY handling of punching and forming operations. Capacity 2" hole in 16 ga. iron, 100 holes per minute or better. Four sizes, 7", 10", 18" and 24" throat depth.

OVER 80 USEFUL METAL-WORKING TOOLS

WHITNEY METAL TOOL COMPANY
115 FORBES STREET • ROCKFORD, ILLINOIS

actuated cams. These closely spaced cams are actuated into and out of engagement smoothly and instantaneously yet are said to be as positive in action as a gear.

The clutch consists of three primary elements: — driver, driven, and cam clutching members. Since the wedging cams are always in light contact with both driver and driven members, they instantly lock these members together when torque is applied and drive the load. Likewise, when application of torque ceases, the cams instantly unlock, permitting driver member to rotate to indexing position on return stroke. In effect, the clutch is a self-contained ratchet of an infinite number of teeth. Therefore, unlike ordinary pawl and ratchet mechanisms, varying indexing adjustments do not alter the feed accuracy.

Morse Indexing Clutches are furnished in 12 standard sizes. Torque capacities range from 26 to 6300 foot pounds.

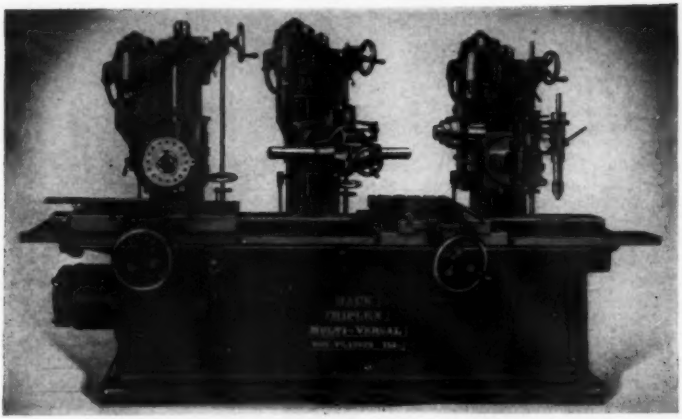
Cling Oil Test Kit

Many purchasers of industrial lubricants lack the time and equipment to make extended performance tests on machine oil, so L. R. Kerns Co., Inc., Chicago, offer a simple Test Kit with which the adhesive qualities of their product, Cling Oil, can be quickly demonstrated.

The Kit comprises an easel on which are mounted twin tubes, one of standard mineral oil and one of an equal grade of Cling Oil. When these tubes are punctured, the relatively slow drainage of Cling Oil shows its coverage and adherence.

Cling Oil is a clear polymerized, adhesive oil of high lubricity. Viscosities are obtained through chemical treatment; no oxidizing elements are added. It has been given competitive tests on Steel Mill Cranes, Bearings, etc., with the result that it is being marketed as an economy product. It is claimed to reduce lubricant, labor, power and general maintenance costs. Men with lubrication problems may have this demonstration kit by writing to the Company at 2814 East 95th St., Chicago, Ill.

Hack Announces Versatile New Models



Two interesting new machines which should be useful in the machining of many complicated small and large parts, jigs, dies, tools and fixtures for the current defense programs, have been developed by Hack Machine Co., Des Plaines, Ill. These new units round out the line and represent an important development in furthering the all-purpose utility principle which has characterized previous machines offered by this Company.

The standard Simplex Multi-versal machines have already been described in the Machine Tool Blue Book.

The new Duplex machine is a two column unit employing the standard Multi-versal at the left, and a 2½" horizontal boring bar in the other column as shown. This boring bar has a travel of 18" and can be rotated 360° to bore holes at various angles. The bar is fitted with a taper at both ends and can be employed in machining work on either the right or the left tables.

The Triplex machine illustrated has a third column at the extreme right, normally fitted with a radial drill head, but so constructed as to permit the use of any of the regular Multi-versal attachments.

PACIFIC 12"x12" HYDRAULIC PRESS

10 ton capacity — Dimensions inside posts 8½" x 8½"— Die height 8" — Movement of platen 3".

The press is otherwise similar to our larger sizes and lends itself to numerous small jobs and applications.

Write for literature and prices.

Pacific Hydraulic Press & Tool Co.
P. O. Box 87, Huntington Park Station
LOS ANGELES, CALIFORNIA

In such set-up, the column at the extreme left provides the reciprocating motion typical of the Simplex units, while the central and right hand columns are stationary. The latter two columns may be interchanged to meet the user's requirements. Additional columns may even be added to permit a further sequence of operations with one pass of the table.

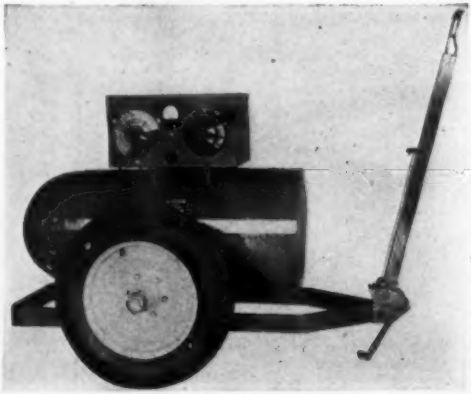
Two men can be engaged in operating the machine if necessary, each performing an entirely different operation, or sequence of operations, with a corresponding gain in production. Extremely long work can be machined, straddling both tables if necessary.

The underlying advantage, as in the case of the Simplex Multi-versals, is that jigs and tools in many cases can be machined completely without removing the work, and a regular sequence of operations such as vertical milling, angular milling, horizontal milling, horizontal boring, radial drilling, vertical, horizontal and angular jig boring, slotting and many other operations, may be handled without moving the work about the shop from machine to machine, and with a material saving of the operator's time. Obviously, with Duplex or Triplex columns, fewer changes of attachments are necessary. Incidentally, at least 30 distinct and different metal cutting operations may be performed by means of these attachments.

The machine has vernier scales in all directions and provides a range of speeds and adjustments adapting it for precision tool room work or production machining of aluminum and magnesium alloys as well as cast iron, mild steel and tool steel.

Two-Wheeled Welding Machine Trailer

A new two - wheeled light - weight pneumatic-tire trailer for mounting arc welding machines for easy, fast portability, is announced by The Lincoln Electric Co., Cleveland, O.



Designed for mounting Lincoln SAE 200 to 600 ampere AC motor driven or Type SA 200 special engine driven Lincoln arc welders, the new unit can be used for road towing up to approximately 30 miles per hour; can be hitched to a factory mule or industrial truck and is easily moved by hand by virtue of the low, underslung construction, narrow 31" tread and method of balancing. It is of arc welded steel construction throughout.

Mounting is readily accomplished by means of four bolts in frame of trailer which register with holes in lugs on welding machine.

The combination tow bar and standing support has a hand - operated ratchet arrangement for locking support arm in position.

The trailer has wide application in factories, industrial plants, metal-working shops, welding and maintenance, garages, etc., where ready mounting and easy portability are essential for maintenance, miscellaneous fabrication or construction.

The unit measures 66" long, 42" wide, 16" high (over tires) and weighs 282 pounds. Tires are 16" by 5.50", 4 ply.

T-Square With Transparent Blade

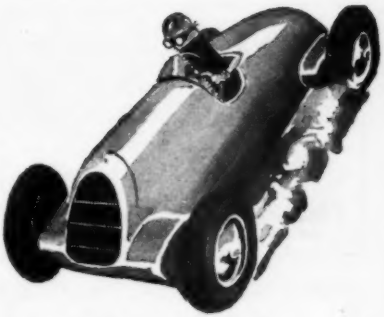
Of special interest to engineers and draftsmen is the new Escolite T-Square. Recently announced by Engineering Sales Co., Sheboygan, Wis., it permits viewing the entire drawing without moving T-Square.

The head is of black laminated Bakelite composition, 5/16" thick—blade is of Escolite, .090" thick. Both materials are made especially for the purpose and will not warp, bow, chip, crack or split. Escolite is a special crystal-clear, fully transparent plastic that will not discolor or turn brittle—will retain its transparency and accuracy indefinitely.

Eight cone-shaped pins are accurately and securely set into head. Pins engage corresponding openings in blade, eliminating wobble and automatically taking up play. No paper rabbet is necessary because head is held 1/16" away from blade. A special die casting and single screw hold entire assembly together. Can be detached quickly and when used as a straight-edge, no projections or fittings appear on either surface of blade to interfere with smooth, easy operation or to cause injury to drawings.

Available in seven popular sizes:—12, 18, 24, 30, 36. 42, 48". Construction provides for addition of a swivel head at any time or T-Square can be ordered thus equipped. Swivel head is made to exact size, shape and of same material as fixed head and is complete with knurled thumb screw. Can be quickly attached when required. Special locking arrangement holds swivel head securely.

A handsome new catalog, illustrates the complete Esco line of fine drawing room equipment.



SETS NEW RECORDS

CUTTING CRANKSHAFTS

Capewell precision-cutting hack saw blades, which recently made a record by sawing 26.6% more crankshafts, will likewise speed up your production — by cutting faster, lasting longer, saving time on subsequent operations. Ask your mill supply man for details.

THE CAPEWELL MFG. CO.
Hartford, Conn., U.S.A.

CUTS COSTS SAVES TIME

CAPEWELL

HACK SAW BLADES

A Tote Pan of Many Uses

Durable — Liquid tight — 5 gallon capacity—pressed from 1/16" sheet steel — 21-1/2" x 13-3/4" x 5-3/4" inside.

Write for low prices today.

The Salem Tool Co.
SALEM, OHIO

TO INSTRUCT NEW MEN IN THE HANDLING OF DIAMOND TOOLS

we will send you a valuable booklet. No charge, no obligation.

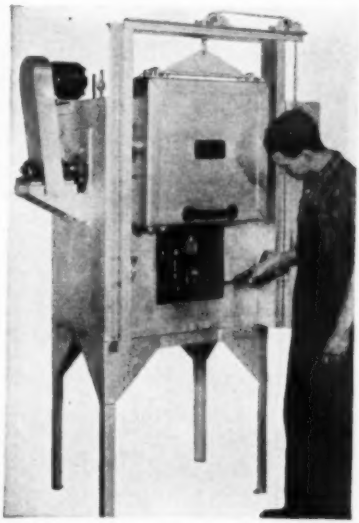
KOEBEL DIAMOND TOOL CO.
9352 Grinnell Ave., Detroit

KOEBELITE DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for all Industrial Purposes.

Furnace for Light Metals

Despatch Oven Co. offers a new improved CF furnace which is claimed to be more adaptable to tool room tempering and drawing work, to the heat treatment of aluminum rivets and other aluminum alloy castings and



parts, to the preheating of aluminum billets before forging, to the heat treatment of magnesium alloy castings and to general production work requiring

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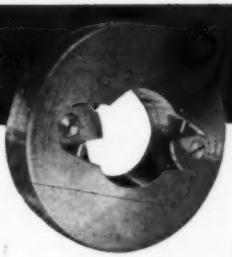


for your lathes **SENECA FALLS** *Automatic* **WORK DRIVER**

Self Centering ... Quick Acting ... No Slip. Attaches to any chuck plate or spindle. Provides a slip-proof, balanced drive reducing chatter. Handles rough forgings or turned pieces—straight or taper. Eliminates dogging time. Reduces tool breakage. Write for details and size range.

SENECA FALLS MACHINE CO., 314 Falls St., Seneca Falls, N. Y.

a temperature range of from 300 to 1200 degrees F.

Body construction of the furnace has been made a great deal heavier and heavy duty lift doors have replaced former swing type doors.

Fan capacities have been increased and the method of interior heat distribution and circulation has been modified to give uniformity.

Standard furnaces in this line range from 13x13x13" to 37x37x25". Special sizes can be quoted upon request. These new furnaces are available with either gas fired or electric heating systems. Prompt deliveries can be made to assist any who need this equipment in National Defense Work.

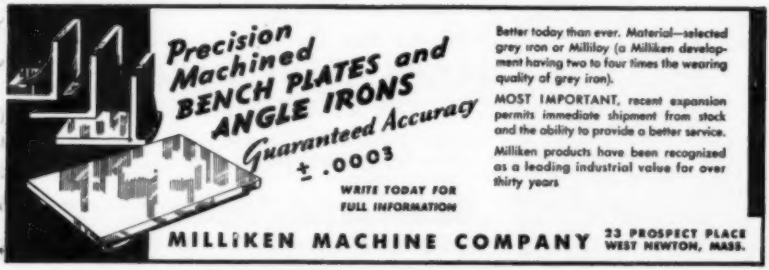
This new furnace is manufactured by the Despatch Oven Co., 622 Ninth St., S. E., Minneapolis, Minn.

G. E. Tri-Clad Bulletin

Publication GEA-3580, recently issued by the General Electric Co., Schenectady, gives many interesting highlights on the design, construction, and application of the new line of Tri-Clad motors.

Well illustrated, concise and graphic in style, the booklet literally takes the motor apart to show how extra protection has been built into the line. Particular attention is called to the motor's one-piece, cast-iron frame and end shield for protection against physical damage; the stator windings of tough Formex wire for protection against electrical breakdown; and the new design of bearings for protection against operating wear and tear.

Other photographs in the leaflet show the many types of Tri-Clad motors now available and some typical industrial applications.

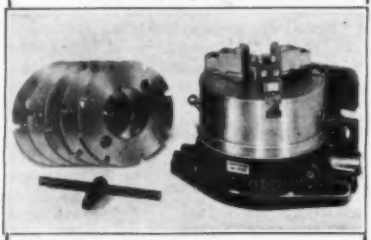

Precision Machined
BENCH PLATES and ANGLE IRONS
Guaranteed Accuracy
± .0003
WRITE TODAY FOR FULL INFORMATION
Better today than ever. Material—selected grey iron or Milliloy (a Milliken development having two to four times the wearing quality of grey iron).
MOST IMPORTANT, recent expansion permits immediate shipment from stock and the ability to provide a better service.
Milliken products have been recognized as a leading industrial value for over thirty years
MILLIKEN MACHINE COMPANY
23 PROSPECT PLACE
WEST NEWTON, MASS.

Screw Machine Cams

IMMEDIATE DELIVERY

BANNER MANUFACTURING CO.
1871 Clybourn Ave. Chicago, Ill.

FOR MILLING, DRILLING, SLOTTING, OR PLANING



FOR ONE PIECE— —OR FOR THOUSANDS

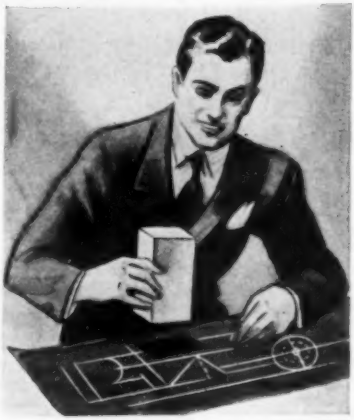
The HARTFORD "Super-Spacer" indexing fixture was designed to meet the demands of modern feeds and speeds. Its unequalled versatality fits it equally well for special work or for production jobs. Quick set-up—rapid, accurate indexing—elimination of error—greater rigidity—all these are yours in this new device.

Send today for complete information.

Hartford Special Machinery Co.
285 Homestead Ave., Hartford, Conn.

"Shortcut" Blueprint Course

A new and simplified home study method of instruction in reading blueprints of all kinds is announced by Austin Technical Institute, Newark, N. J.



Called the "shadowgraph" method, it is described as considerably easier to grasp than former methods of blueprint reading instruction. Great savings in cost and time required are claimed.

The method is based upon use of actual working models of objects, and projections of shapes and dimensions as shadows are thrown by the sun or other single source of light. The student receives as part of the course a working model containing actual blueprints.

The method is the result of two years

Why Not Buy The Original Electric Etcher?

MARK IRON AND STEEL

THE ETCHOGRAPH WAY

New ELKONITE TIP pencil.
New Baby Grand Model at a lower price.

2,000 in use

BREWSTER - SQUIRES CO.
42 Church St., New York, N. Y.

The ACME JIG BUSHING CATALOG Can be seen from two sides

One is *GREEN* for the A. S. A. Standard.
One is *RED* for the Acme Standard.

Together these standards furnish the most complete selection of standardized jig bushings available.

Write for this catalog. It will help with the selection of bushings for your jigs and fixtures.

ACME INDUSTRIAL COMPANY

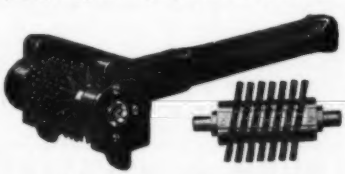
Makers of Standard Jig and Fixture Bushings

210 N. Laflin St., Chicago, Ill., MONroe 4122

GRINDING WHEEL DRESSERS—VISES

We manufacture the only complete line of Grinding Wheel Dressers and cutters and will gladly suggest the proper one for your wheels.

The exclusive solid steel slide makes Simplex Vises stronger and more serviceable.



Desmond Heavy-Duty Dresser

Simplex Machinists' Vise

Desmond Diamo-Carbo Dresser, best tool room dresser.

Write for catalog H showing complete line of Desmond Dressers and Simplex Vises and name of your nearest dealer.

DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Canadian Desmond-Stephan Mfg. Co., Ltd.—Hamilton, Ont.

"TRU-V" BLOCKS

Why Not Save Time—by having enough V-Blocks available at all times in your shop to avoid the delays involved in make-shift set-ups and tie-ups?

"TRU-V" Cast-Iron Blocks are available in five husky sizes:— 4", 5", 6", 8" and 10". Each block is carefully machined on all sides, with close limits held within .001" where required. A machined ledge on both sides provides for clamping on machine bed.

Let us send descriptive bulletin. Or contact your mill supply dealer.

Oliver Motorcraft Corp.
2532 S. Wabash Ave., Chicago, Ill.

GRIT-CUT ABRASIVE CUTTER

Designed for tool rooms. Can be utilized for light production. Two convenient sizes for mounting on bench. Legs supplied at an extra cost. An inexpensive cutter costing only

$140.00

Does quick and accurate cutting at minimum cost. No job too hard for Grit-Cut.

For quick repairs the cartridge type spindle can be removed and assembled spindle substituted.

The No. 6 machine capacity is 1" solid or 1¼" tubing. Size of wheel is 6". Motor is ¾ h.p., 3450 R.P.M. Spindle speed 10,000.

Let us send you complete details.

TUBE METHODS, INC.
Depot & Rambo Sts., Bridgeport, Penna.

of collaboration by a group of outstanding instructors in technical colleges. An important claim made is that the "studying" is so simple and clear that the practical workman's dread of wading through dull and perplexing text matter is almost wholly removed.

Huge Airplanes of the Future

Airplanes larger and with a greater passenger carrying capacity than trans-Atlantic liners are foreseen for the future by Igor I. Sikorsky, Engineering Manager of Vought Sikorsky Aircraft Division, United Aircraft Corp.

Speaking before the A. S. T. E. recently, Mr. Sikorsky, who recently broke all records for sustained free flight in a helicopter, said he did not believe that such planes—able to carry 1000 passengers—would be designed for stratosphere flying.

As far as airplane speed is concerned, Mr. Sikorsky expressed himself as of the belief that we have just about reached the limit with our present source of power. To obtain higher speeds, new sources of power will have to be developed. He pointed out that in seven years, the speed record has climbed from 441 to only 468 m. p. h., though prior to the 441 m. p. h. record, advances in speed were spectacular from year to year.

Trans - Atlantic planes capable of carrying at least 100 passengers will be in service within the next decade, Sikorsky estimates, pointing out that large planes are more efficient than small ones.

BURR KEYSEATERS

Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

Interesting Felt Handbook

The story of the manufacture and uses of felts is recounted in a 73-page book announced by the Felters Co., 210-G South St., Boston, Mass. "A Felt Handbook" relates how three companies were founded many years ago to manufacture felt for special purposes. One made saddlery felt, another produced piano felt, and a third prospered in the manufacture of a new felt for the millinery trade.

These three firms were combined into a single company known as The Felters Company, Inc., to pool their combined experience and facilities in the manufacture of felt for all purposes. "A Felt Handbook" gives a detailed picture of the main phases of felt making and its applications in chapters on:—raw materials, manufacturing, the cutting factory (for cutting felt to customer's order), the research laboratory, and sales and uses.

The widespread and varied use of felt is aptly illustrated by "Unisorb" Foundation Felt, which is used in the installation of machinery. It is said to reduce noise and isolate vibration, in many cases increasing production from the same machine. Felt seals are useful in excluding dirt, dust, and grit from oil used for lubricating machines.

Announcing Donberg and Danits

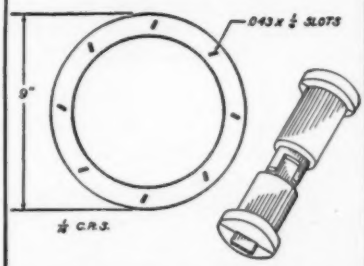
With a combined experience of 35 years in the machine tool field, Joseph H. Donberg and Samuel Danits announce opening of their offices at 548 W. Washington Blvd., Chicago, (Phone —Central 9795). They offer a comprehensive line of tools and are prepared to purchase equipment which may be released, including complete plants.

Beg Your Pardon

Through an unintentional oversight, we did not acknowledge that the excellent story on Laminated Plastics on page 123 of the July issue, was based on material prepared by Messrs. S. W. Place and F. I. Bennett of the Synthane Corporation. Our apologies to these gentlemen, and to the readers.

Punch

don't drill small holes



Another Difficult Piercing Job Made Easy with DURABLE PATENT PIERCING PUNCHES

This is a side ring for a squirrel cage fan assembly. The ring must be made of heavier material than the blades, which are of 20 gauge material, and the slots in the rings must be narrow to fit this thickness.

An ordinary punch would not do the job, but it is now being done successfully with a piercing punch supported with the Durable patent intermeshing sleeve.

Many difficult piercing operations have been made easy by using these patent piercing punches.

Write for free handbook on piercing operations, showing easy solutions of many difficult piercing problems.

DURABLE PUNCH & DIE CO.
2240 W. Ogden Ave., Chicago, Ill.
EASTERN OFFICE
1257 Commercial Trust Bldg.. Philadelphia, Pa.

ELECTRO-MATIC RECTIFIERS

SPECIFICALLY DESIGNED FOR INDUSTRIAL USE—

Precisely engineered to meet increased demand for dependable rectifiers ..... In a range of 42 voltage combinations - from 125 to 3000 watts capacity.

SIMPLE in operation. COMPACT—can be built directly into your equipment. Many other features.

With the NEW AUTOMATIC TIME DELAY SWITCH (in larger units) to protect rectifier tubes. A "money saver and production increaser"—prevents throwing the load on tubes until properly warmed up, etc.

NEW BULLETIN "61" gives complete information. WRITE for your copy.

ELECTRO-MATIC PRODUCTS CO.

Makers: NEUTROL Electro-magnetic Chuck Control

2235-37 NORTH KNOX AVE., CHICAGO, ILLINOIS

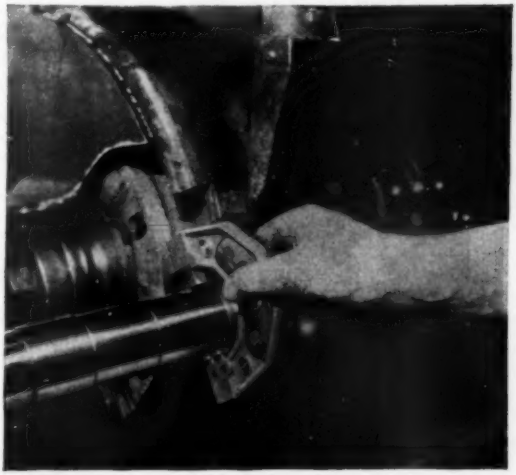
Pneumatic Counterbalances for Presses

The Dayton Rogers Mfg. Co., 2830 13th Ave., South. Minneapolis, Minn., announces a new Model GT Counterbalance Cylinder for large, straight - side punch press equipment.

These pneumatic counterbalance cylinders operate direct from the air line system in the average shop and serve to counterbalance the large rams on the larger straight - side presses, compensating for increase or decrease in the size of die tooling equipment fastened to the press ram. This counterbalance compensator is regulated by a combination pressure gauge furnished with each set of counterbalance cylinders.

The counterbalance cylinders are installed in groups of 2, 4 or 6 and automatically take up the lost motion due to wear of parts and large clutch mechanisms, especially objectionable on large dies both in forming and blanking operations. With these counterbalance cylinders it is asserted that a press operating with a clutch jam may be operated without the use of the retarding brake or with only slight friction on the brake itself, as the counterbalance cylinders will give the required retarding controlled action. The cylinders are made from 6 to 14", having strokes from 12 to 24". Both the steel polished cylinders and piston stem are hard chrome plated, preventing rusting and pitting.

P & W Adjustable Limit Snap Gage

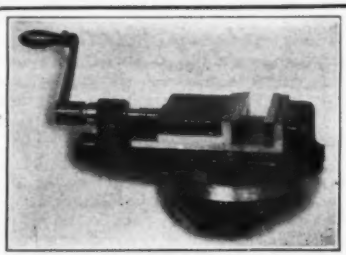


Pratt & Whitney announce the Trusform Adjustable Limit Snap Gage, Model "C," with one solid anvil, two adjustable anvils and bakelite insulating grips. The Trusform frame is finished accurately square so that the anvils are parallel and in line, it is claimed.

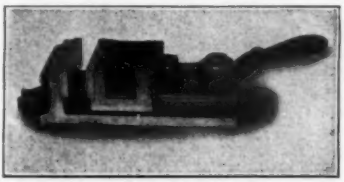
The bakelite grips supplied with each Model "C" Gage insulate it from the heat of the operator's hand. The solid anvil projects beyond the end of the frame and the adjustable anvils. This permits the gage to locate itself quickly on the work.

The adjustable anvils have a rectangular head providing a broad wearing surface. They are made of high grade tool steel, are heat treated, and

The Modern Swivel Vise **The Modern Quick Acting Cam Vise**



Base graduated in degrees
Alloy steel hardened screw
Hardened & ground jaws
Made in several sizes
Weight 36 pounds
List Price $40.00

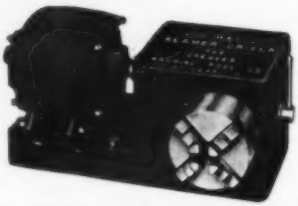


All steel parts hardened
Hardened alloy steel screw & handle
Hardened & ground jaws
Semi Steel castings thruout
Made in two sizes
Weight 20 pounds
List Price $35.00

Manufacturer of high speed steel and carbide cutting tools.

MODERN TOOLS, E. Berlin Conn.

Only $138.50 Buys This



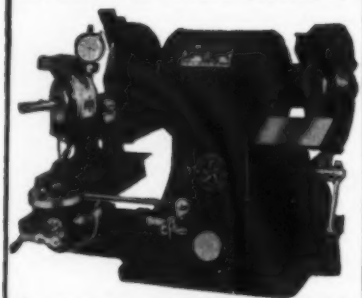
GREAVES REAMER DRIVE

- Cuts reaming time in half
- Assures smooth, accurate holes
- Complete with motor & foot switch
- Capacity up to 1½"

Write for circular

GREAVES MACHINE TOOL CO.
CINCINNATI, OHIO

Precision Drill Grinder



Simple to operate—dependable—speedy—this Precision Grinder will enable you to produce perfect points on standard twist drills in sizes from No. 41 (.096) to ⅝" (.625).

Send today for more details.

Star Machine & Engineering Corp.
Division Star Electric Motor Co.
Bloomfield, - - - New Jersey

then lapped flat and square with the shank. This lapping is done by an adaptation of the Hoke process to provide maximum bearing with a longer wearing surface combined with fine accuracy.

Snap gages should be set and sealed in the gage inspection department, and given to the operator ready for use. Unskilled operators are able to work to them, and possible errors derived from misreading flexible measuring tools are eliminated.

A New Morrison Bulletin

An especially attractive new bulletin presents the Morrison Style B Master Feed Fingers and Pads.

The first page has been arranged to enable a prospective customer to visualize the range of Style B Master Feed Fingers and Pads. The second and third pages clearly present reasons for using Morrison Master Feed Fingers and Pads rather than conventional solid feed fingers, while the last page gives complete ordering information and prices applying for these items as used with the various Automatic Screw Machines.

Copies may be obtained by addressing Hardinge Bros., Elmira, N. Y.

Industrial Imports

Imports of industrial machinery in 1940 were valued at $4,125,661, a 48 per cent decline from the 1939 total of $7,893,152, the Department of Commerce reports.

The most important factor in the trade was the large decrease in purchases from Germany. Imports from Germany, which is usually the principal supplier of this type of equipment, dropped from $3,639,354 in 1939 to only $175,335 in 1940.

Imports from the United Kingdom in 1940 amounted to $2,026,879, showing practically no change from the 1939 figure of $2,052,203. Industrial machinery imports from other countries of considerable importance in 1940 were:—Sweden, $635,454; Switzerland, $633,792; Canada, $289,010; and France, $114,845.

Holding Device for Threading 37 m.m. Shell Caps

A new fixture recently developed by Landis Machine Co., provides a means for holding 37 m/m Shell Caps rigidly in alignment for threading.

This device comprises a hardened and ground supporting bushing, a supporting center, and a supporting center locking member.

In operation, shell cap is placed on supporting center while in the position shown. The center is then moved forward until work enters and seats in supporting bushing. Work is then locked into position for threading with the supporting center locking lever. The entire unit is adjustable both horizontally and vertically to assure alignment of the work with center of rotation of threading die head thus assuring production of concentric threads.

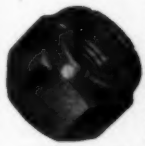
This fixture is designed for use on Landis ¾" and ⅞" Single or Double Head Threading Machines. Shape of parts will not permit gripping on outside surface and make it necessary to employ this socket type fixture and an internally tripped die head. Any slight variation in size would change location of work in fixture. Thus, the internally tripped die head prevents the chasers from striking shoulder of work and assures threads of uniform length.

Due to the fine accuracy required for the thread, it is recommended that die head be of the hardened and ground type and also that machine have a leadscrew attachment. The leadscrew will assure a correct start of die head onto work so the first threads are accurately formed.

Burgess Conference Acousti-Booth

The Burgess Model 501 Conference Acousti-Booth, for use in noisy plants where a quiet conference place is necessary, has just been announced by the Burgess Battery Co., Acoustic Division, 520 W. Huron St., Chicago. Similar in

FOR REAL PROTECTION AT VITAL FASTENINGS



IN every Elastic Stop Nut, a resilient non-metallic collar eliminates thread play automatically . . . and holds thread faces of nut and bolt in a constant pressure-contact. Cannot be loosened by vibration or hard service.

CATALOG contains a graphic explanation of the Elastic Stop principle, presents test and application data, and lists the complete line of nuts. • Write for a copy.

ELASTIC STOP NUT CORPORATION
2325 VAUXHALL ROAD • UNION, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS

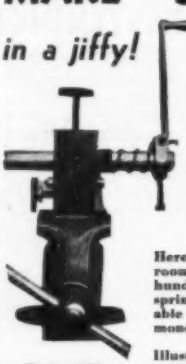
New Britain UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.

Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

MAKE SPRINGS *in a jiffy!* *with* Blaner Universal Hand SPRING WINDER



Here's a profitable tool room unit. Quickly makes hundreds of sizes of springs. Sturdy, dependable . . . a real time and money-saver.

Illustrated is No. 4 Universal with adjusting shaft of 3/8" square. Takes wire up to 1/4" diam.

Patent No. 2052443

Write for your Circular.

THE JOHN BLANER CO.
Corner Meek & Elm, Sharon, Pa.

construction to the Burgess Telephone Acousti-Booth, this new conference booth has walls of sound-absorbent construction to soak up factory noise.

It is designed to meet the need for a large "zone of quiet" for conferences in noisy factories, for use where several telephones may be installed in one location, and for testing operations such as listening for noise in electric motors. It may even be used as a temporary miniature office in new or remodeled factories where construction is not complete.

Sound absorbing walls in the conference booth blot up extraneous noise and allow persons within to carry on work without noise interference. The doorless entrance at either end permits ready access and provides ample natural ventilation. Acoustic construction of the booth makes doors unnecessary. A folding table—23½"x24"—and overhead electric light fixture add to its convenience. It is easily portable and can be assembled and ready for use in a few minutes time. Constructed of heavy gauge steel and finished in black wrinkle finish on the exterior, with gray interior. Outside dimensions are 56½" long, 54½" wide, and 79½" high. Shipping weight 1000 lbs.

The "BABY GIANT" VANDERBEEK Universal Joints

are obtainable in two sizes—the "Baby Giant" for instrument and control work; and the "Giant", with hardened and ground working surfaces for heavy duty work.

Send us your requirements — We'll send you prices.

AMERICAN TOOL WORKS, INC.
26 FRANCIS AVE. -:- HARTFORD, CONN.

Horse Sense

I think if I worked for a man, I I would work for him. I would not work for him part of the time, and the rest of the time work against him. I would give an undivided service or none. If put to the pinch, an ounce of loyalty is worth a pound of cleverness. If you must vilify, condemn and eternally disparage, resign your position, and when you are outside, damn to your heart's content. But, I pray you, so long as you are a part of an institution, do not condemn it.

(Elbert Hubbard)

Key Men

Sometime ago at the Westinghouse Plant, each foreman was handed a list of the following questions:

What would I do tomorrow morning if my key man would die tonight?
How many key men do I have?
Write their names on this sheet?
What would I do if I lost all my key men?

These questions provoked an amazing amount of discussion. For the first time many of the foremen were aware of the need for training, and realized that training may be something aside from desks, text books and a lot of other things—that it must also be learning skills on the job, from someone who knows how. The idea primed all foremen for the job-training progarm which was introduced in the plant soon after.

Have you our Engineering Data Sheets on the new line of

BABY GUSHER
Machine Tool Coolant Pumps?

Made in four types; 1/30 and 1/10 h. p. for small machine tools and machines requiring from 4 to 10 G. P. M.

Write for descriptive literature.

The Ruthman Machinery Co.
283 Pike St., Cincinnati, Ohio

Special Anti-Mushrooming Anti-Chipping Heat-treat

Oversize Shanks
Exclusive Knurled Back
Exclusive Thumb Grip
Broach-Rounded Corners

and a complete line of Marking Devices

Write for Price and data Bulletin No. 113-12 A

NEW METHOD STEEL STAMPS, Inc.
149 Joseph Campau, Detroit

FlexoiD Dependable PRODUCTS

FlexoiD Industrial Couplings

with Thermoid fabric discs

FlexoiD Tool Holders

WITH UNIVERSAL HEAD

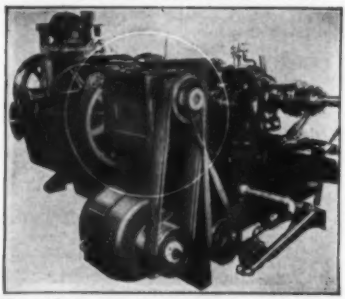
"It's all in the Tool"

sent on 30 day trial

FlexoiD Speed Control

4 and 8 speed models

Converts old machine tools into modern individual drives



FlexoiD Speed Control unit applied to Cleveland Automatic

Write for complete details or wire collect for information regarding nearest distributor.

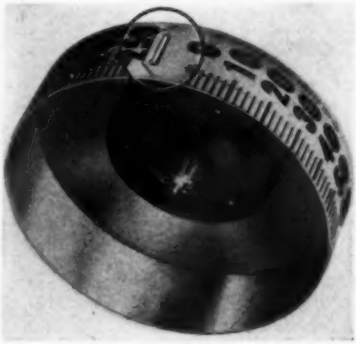
The Smith Power Transmission Co.

1545 E. 23rd St., Cleveland, Ohio

Fastening Method Speeds Production

A number of manufacturers are reporting time-saving and cost-cutting results through the increasing use of machine-driven staples

For instance, a manufacturer had been fastening paper calibration slips to metal cylinders at a cost of 70c per 100 wheels. Speed of operation was the important factor bearing upon costs. By installing a Bostitch stapling machine, it is asserted that costs were



reduced to 20c per 100 wheels.

This is cited as a single example of the way a change in fastening method can increase production and lower costs. Heavy Duty Steel - Stitchers, which make their own staples from a coil of wire, are now able to pierce cold-rolled steel 60/1000" thick, or penetrate copper to thickness of five pennies. Widely used in automotive and other metal-working industries, many different models of stitchers, staplers and tackers have proved valuable in fastening many varied products.

Mailing Bags

The Ames Bag Machine Co., 1991 East 66th St., Cleveland, has developed a new type of cotton parts bag for industrial use. This bag is available with two or more compartments sewed into the cloth. It is designed for use where two or more parts of any kind must be

600 ROOMS with BATH and RADIO

FROM $3.00

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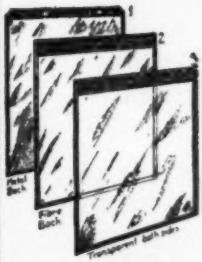


with

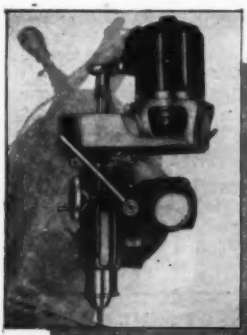
WADE Shop Envelopes

Any size or style to order, stiff or flexible, to suit your requirements.

Send for folder and quotation.

WADE INSTRUMENT CO.

1422 E. 109th St., *Cedar 4728*, Cleveland, O.



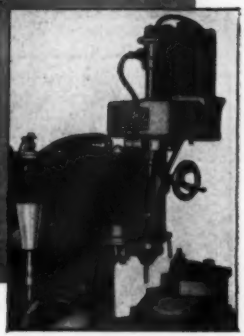
EKLIND UNIVERSAL MILLING HEAD

AND TURCHAN

HYDRAULIC DUPLICATING UNIT

Model A HC Eklind Turchan Duplicating Attachment is designed and priced for die shops making Bakelite, Plaskon, Rubber and Drop Forge molds and dies. Will handle average work efficiently, economically and speedily. Oil pressure controlled by tracer, feeds spindle and tracing arm to follow model accurately. Die capacity is 18" long by width depending on cross feed of machine. Capacity can be increased by mounting head on side of overarm.

Model A H Eklind Universal high speed Milling, Drilling and Boring unit is a most valuable tool room aid. Can be had separately and the duplicating attachment added later.



Send for our bulletins giving full details and prices.

UNIVERSAL HIGH SPEED TOOL CO.

551 W. Washington Blvd., Chicago, Ill.

For Machine and Tool Work & Quick Set-Ups

The only 3-way reading precision indicator. Accurate in either direction. Feeler mounted in centered cone bearings. .014 reading.

Price $5.00 plus postage *Write for folder.*

J. R. Reich Manufacturing Co.
45 E. Stroop Rd., Dayton, Ohio

Greater Economy On Reduction Drives for Conveyors and Assembly Lines

Abart TYPE "B" RATIOS 25 TO 1 UP TO 2000 TO 1

Very Slow Output Speeds Possible

TYPE BBB WILL GIVE A REDUCTION UP TO 20 MILLION TO ONE

COMBINATION WORM AND SPUR GEAR REDUCTION UNIT

Suggested for very slow output speeds. Solves many difficult speed reduction applications. Either vertical or horizontal types. *Write for information.*

GEARS: Made to specifications only. *Send B/P for estimate.* Prompt deliveries as usual.

ABART GEAR & MACHINE CO.
4832 W. 16th Street, Chicago, Illinois

shipped together but with some protecting wall between them.

It is emphasized that in such cases, they speed operations by saving the time consumed in separate wrapping of parts; prevent marring or other injury; save space and their light weight saves mailing cost.

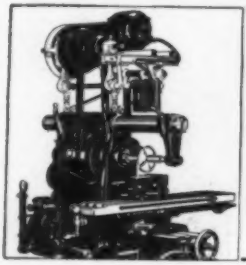
Aircraft companies have already started to use them for shipping small, polished parts by airmail from parts plants to assembly plants, and from manufacturing plants to airports for speedy repair of disabled planes. They are well adapted for shipping or mailing of bearings, springs, pump and compressor parts, small gears, nuts and bolts and the like. They can be made in any size or shape, with any number of compartments, and come in three general types.

Welding Positioner Bulletin

A new bulletin illustrating and describing improvements in their 3 and 8 ton capacity Welding Positioners has just been issued by the Industrial Division, Ransome Concrete Machinery Co., Dunellen, N. J.

The bulletin is devoted in part to a comparison between ordinary welds and positioned welds, illustrating both and providing a table showing the time required for each type.

Improvements made in the positioners are completely described. They include a T-slotted, all welded table top, double tilting-gear segments, Timken double roller bearings in main spindle and all welded steel yoke and base frame. The manufacturer points out that the all welded construction assures safety to the operator when working under full load conditions.



OLD MACHINERY REJUVENATED

Why worry about machine tool scarcity when you can increase efficiency of your present machinery with Remco Motor Drives. The only drive made to take ANY motor of reasonable size—new, or USED. No need to buy new motors, or new machines. Only drive on which motor may be switched instantly in case of "burn-out". Descriptive folder FREE—Write! Remco Products Corp., State St. at R.R., York, Pa.

REMCO MOTOR DRIVES
for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

Presto-Vise Offers Time-saving Features

An unusual degree of adaptability is claimed for the Universal Presto-Vise, produced by D. A. Smith & Co., 8097 Livernois, Detroit, Mich. Whether used as a drill jig or milling fixture on production work, or for tool room use, the Presto-Vise is said to be a time-saver.

The left-hand vise is set up as an adjustable drill jig that may be used for low production jobs. The right - hand vise is set up with standard jig bushing plate as a fast and easy-operating drill jig.

Construction of the Presto-Vise incorporates an overriding ball clutch plus toggle clamping mechanism. It is asserted that the combination of these two principles makes this an unusually valuable tool for a wide variety of production jobs. A pressure adjustment screw is also helpful.

Jaws are 5¼" wide and 1 15/16" deep. Maximum opening is 4".

Blade Breakage Stopped Production Insured

BY INSTALLING

PADDOCK Ball Bearing BAND SAW GUIDES

Recommended for New and Old Machines cutting all material at any speed.

SENT ON 10 DAYS' TRIAL

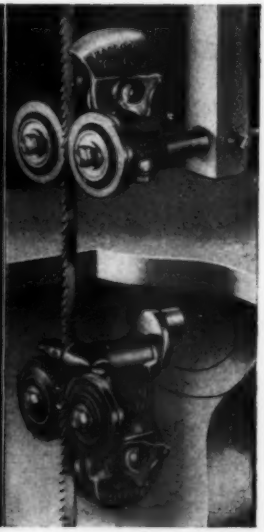
The use of Paddock Ball Bearing Guides increases the efficiency of the machines so that more and better work can be done. The hazard of operation is reduced. Most of the blade breakage is eliminated. Wheels are interchanged—in effect, three sets of guides in one.

Write for details today and list of prominent manufacturers using Paddock Guides.

PADDOCK TOOL COMPANY

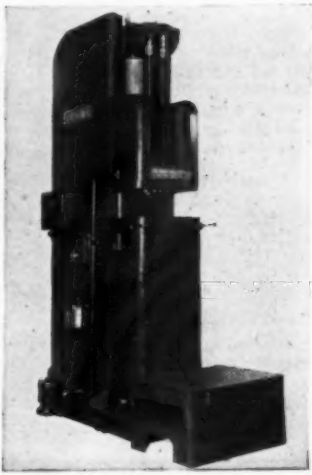
Guide Makers Since 1920

1418 Walnut St., Kansas City, Mo.



Colonial Pull-Up Broaching Machines

Developed primarily for maximum production in machining round and splined holes, Colonial Broach Co. now offers a complete new standard line of improved Pull-Up broaching machines in "streamline" models ranging from 6 to 25 tons capacity and from 36 to 60" stroke. All machines provide completely automatic handling of the broach. Larger tonnages to meet special requirements can be obtained on special order.



Peak capacities have been substantially increased over former types to provide greater reserve power and smoother operation when tooling is adapted for normal capacities of machines. The machine platen and puller brackets are unusually large, providing space for pulling two or more broaches at one time. Provision is

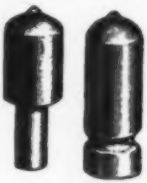
GAGES

Let Us Do Your Special Gage Work

We have every facility — adequate precision equipment and expert workers—for the quick and efficient production of all types of Gages, Special Tools, Dies, Jigs and Fixtures, large or small. We have complete heat treating equipment and can handle jig boring jobs on our 18"x36" Pratt & Whitney jig borer. Have been delivering satisfaction since 1929.

Address all inquiries to Ray W. Rice, Manager.

QUALITY TOOL & DIE CO.
401 N. Noble St., Indianapolis, Ind.



FOR DEFENSE

KARELSEN'S DIAMONDS KEEP THE WHEELS OF INDUSTRY TRUE

DIAMOND POINTED EMERY WHEEL DRESSERS

¼ KT. TO 10 KT.

IMMEDIATE SHIPMENT

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FORMING
For a wide range of work on lathes, shapers and screw machines.
THREADING & FORMING
For fine or coarse threading. Forming tools produce excel-
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Spring feature allows faster feed with heavier cut. Cutter life is tripled.
Thompson
THREADING
Threads close to a shoulder. Produces smooth, accurate threads.

Especially adapted for use in aircraft, automobile and accessory plants.
No Chatter or Tearing. No Breaking of Cutters. No Damaged Work. Write for Details.

AUTO ORDNANCE CORPORATION
1439 RAILROAD AVE., BRIDGEPORT, CONNECTICUT

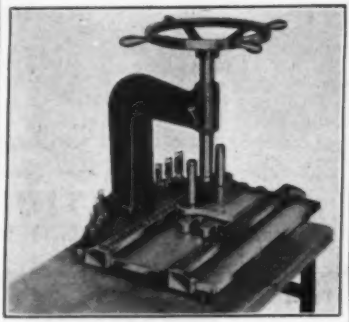
"Pencilpoint" DIAMONDS

Ideal for general truing of small or fine grain grinding wheels. GILMORE "Pencilpoint" Diamonds do not need resetting. Only clear whole stones are mounted in these tools and quantity production accounts for their extra value. Available in ⅛x¾", 3/16x1", and ¼x1¼" holders at only $1.50 each. Other sizes of steel holders furnished without extra charge when ordered in lots of 12 or more.

"Pencilpoint" Diamonds are one of the specialties in our extensive line of mounted industrial diamonds. Write today for our informative booklet.

F. F. GILMORE & COMPANY
122 DARTMOUTH ST., BOSTON, MASS.

Save TIME TAPS TROUBLE with the New VIKING TAPPER



You save time because the Viking Tapper eliminates the wasting of valuable time by highly paid skilled men trying to tap holes accurately by hand. One fifth the time is required.

You save taps because tap breakage is practically done away with. This enables the use of high speed ground thread taps at lower cost than carbon taps. The savings on taps alone will pay for the tapper in a short time.

You save trouble because Viking Tappers take the trouble out of tapping.

For Precision Tool Room Tapping use the Viking Tapper. Capacity ¼" to ⅜".

SEND FOR CIRCULAR

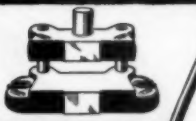
THE VIKING TOOL & MACHINE CORP.

14 MAIN St., BELLEVILLE, N. J.

made for mounting spiral broach drive heads when mechanical means of rotating the broach are required to machine spiral splines.

Automatic handling of broach is obtained through use of hydraulic mechanism. It is not necessary for operator to touch broach at any time. In operating cycle the broach is held in bottom of handling mechanism by locating bushings. When the operator starts machine, after placing part in position over pilot end of broach, a handling cylinder located in base advances broach through platen. An automatic puller located in pull bracket then engages broach. Loading or unloading is easy, since the part is merely dropped over top pilot of broach. This, in combination with automatic handling of broach, insures maximum production for this type of operation. Machines are equipped with dual hand control, preventing operator from starting broach unless both hands are on operating levers.

BAUMBACH



STANDARDIZED

Machined Steel **DIE SETS** Semi-Steel

Drop Forged Steel

Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die service that is unsurpassed. Let us prove it!

Send for our new 336 Page Catalog.

E. A. BAUMBACH MFG. CO.

1810 So. Kilbourne Ave., CHICAGO, ILL.

Pneumatic Die Cushions

The Dayton Rogers Mfg. Co., announces a new design of Pneumatic Die Cushion known as a Model CCC. These should be useful in the Defense Program. These cushions are furnished in double tandem units. They are primarily designed for extremely heavy ring holding pressure on large double-throw, single-crank presses and are used extensively on double-crank, double-throw presses.

Lubricants for Aluminum and Its Alloys

No. 4 aluminum Drawing Oil is a viscous lubricant which it is claimed will not "squeeze out" under the great pressures exerted in deep drawing thin sheets of aluminum. It is reported to have been adopted recently by several large press plants working on Defense Orders, especially airplane body parts, large cooking vessels and the like.

No. 2 Aluminum Cutting Oil is a very thin oil intended to provide the necessary lubricating properties for precision work on threads, hole, etc.

Address Wayne Chemical Products Co., 9446 Copeland St., Detroit, Mich., for information and samples.

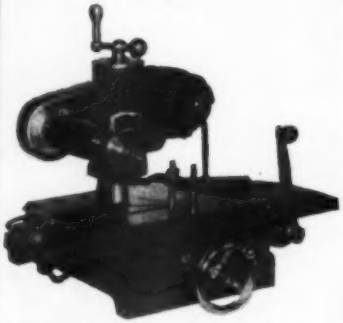
FOR ACCURATE DRILLING YOU CAN'T BEAT UNIVERSAL DRILL BUSHINGS . . .

Super-finished bore straight and round within .0001 assures accuracy and unexcelled wearing qualities. Nickle steel lock screws provide extra strength. Cadmium plated screws prevent rusting. Knurled head allows better grip. Black dome improves appearance, resists rust. Write for data sheet.

UNIVERSAL
ENGINEERING COMPANY
FRANKENMUTH · MICHIGAN

NEW Gibson

Carbide Lip Grinder



Designed to meet the demand for a machine to generate and grind lips, or chip curlers in carbide tools, and to provide means for obtaining positive duplication in such work.

These are some of the advantages of the Gibson machine: Low diamond wheel cost; Compactness; Rigidity; Versatility Smoothness of operation; Easy adjustment; Wide range of usefulness and simplicity of application.

All wearing surfaces receive an abundance of oil. The diamond wheel receives lubrication through felt wicks.

For more details on this time and money saving machine, write to

Kokomo Machine Co.

KOKOMO, INDIANA

"Rivet-Pierce" Machine by Tomkins-Johnson

An automatic feed machine for piercing and riveting is announced by the Tomkins-Johnson Co., 605 N. Mechanic St., Jackson, Mich. This new "RK" model Rivitor allows the work to remain in the same position for both piercing and riveting.

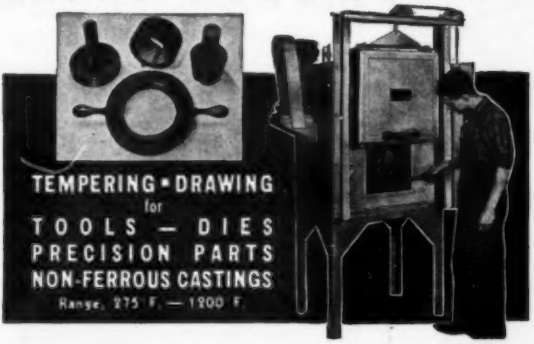
The previously unpierced work is driven down over the underfed rivet, punching a slug out of the work. The head reverses (90°) on the upstroke to bring riveting head into position. On the second trip of the machine the ram descends and heads the rivet, again reversing on the upstroke.

The "RK" handles unannealed solid steel rivets of the "coopers," "tinners," or flat head type up to .140 diameter by ¼" long. They can be set in maximum total work thickness of .075. Ram stroke is 3". Throat depths offered are 8", 12", and 14".

Each stroke is made at the rate of 190 per minute. Production is determined largely by the speed with which the work can be handled.

The new Rivitor features a cast steel

More Production *For Defense*



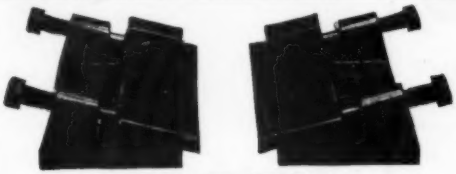
DESPATCH FURNACES

The New Despatch Tool Room Furnace is responsible for increasing production in countless defense plants. Its convenience, its accuracy and general usefulness will improve your precision heat treating situation. It is available in 12 standard sizes. Write for complete details and prices for gas or electrically heated furnaces. Write for Bulletin No. 83C.

PROMPT DELIVERY

DESPATCH OVEN COMPANY

MINNEAPOLIS MINNESOTA



HART'S
Divided Machine Vises

These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The Jaws are tool steel and hardened, the angle holding the work down on the table.

Size of Base	**5x7 inches**
Size of Jaw	**3x6 inches**
Height at highest Point	**2¾ inches**

When writing for descriptive circular kindly mention the BLUE BOOK.

HART MACHINE CO.

26 Mather Street, • Dorchester, Boston, Mass.

HART'S
Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4".

PROMPT DELIVERY

DYER

Heavy Duty Spot Welders

Dyer Welders are available in a wide range of sizes and capacities—air or foot operated, giving maximum production—simplicity of operation—power economy.

Floor models 10 to 35 KVA.

6 point selective switch on all floor models allows for quality welds on various materials. Standard and Underwriters Labeled Machines.

3 point switch on bench models.

Bench models 2½ to 10 KVA—with or without pedestal.

Few Territories Available.

The Topeka Foundry & Iron Works Co.

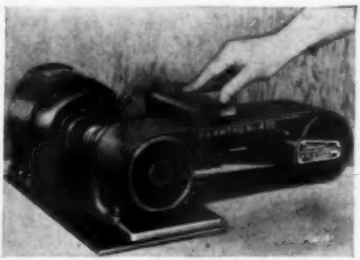
300-332 Jackson St., Topeka, Kansas

head and steel side plates. A solenoid trip and non-repeating action are emphasized. The V-belt drive is actuated by a ½ h.p. electric motor.

Hammond "400" Belt Surfacer

The Hammond "400," a new bench-type belt surfacer for wet or dry buffing, burring, surfacing or polishing, is offered by Hammond Machinery Builders, Inc., 1614 Douglas Ave., Kalamazoo, Mich.

It is designed to reduce the number of rejects in lots of cast or moulded pieces, and to facilitate finishing work formerly done by hand. It is claimed that versatility in the type and number of different materials successfully finished is an outstanding feature. Plastics, stainless steel, ceramics, hard rubber, stone, lead, aluminum, wood and many other types of materials may be



finished. With the proper abrasive belt, the machine may be used for rough work such as removing sprues and flash from rough castings. With a different type belt, a fine luster may be developed on glass, pottery, plastics and like materials.

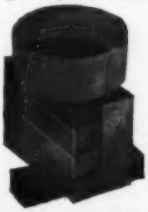
Simply, but sturdily, built, all parts conform to machine tool specifications. Base is of heavy cast iron. Belts, of which a wide variety may be used, are 4" x 35" endless type, running over 4" drive and idler pulleys with 4½" face. Each pulley is dynamically balanced and turns on dust-proof ball bearings. Belt is adjusted to proper position on pulleys by two opposing thumb screws. For positioning work against belt, a work rest, easily adjustable on a segment, is mounted on frame slightly for-

FOR ASSURED ACCURACY USE ULTRA-CHEX

In hundreds of shops ULTRA-CHEX are being used daily:

- For inspection of measuring instruments.
- For resetting 1", 2", 3" and 4" micrometers.
- For checking lead accuracy and lead screws of micrometers.
- For setting various types of machine tools.
- For setting height gauges, vernier calipers and adjustable snap gauges.

Place ULTRA-CHEX in your shop and eliminate guess work, disputes and errors regarding measurements and rejections.



Testing the flatness of Ultra-Chex with Optical Parallel provided. Out of parallelism of used gauge blocks can quickly be detected.

The ULTRA-CHEX set of nine blocks shown above consists of the following .0625"—.100"—.125"—.200"—.250"—.300"—.500"—1"—2".

PRICE with optical parallel $25.00

ORDER TODAY FOR PROMPT DELIVERIES

NOW AVAILABLE—ULTRA-CHEX INSPECTOSET, consisting of 34 blocks with which you can make 80,000 combinations in steps of .0001". WRITE FOR PRICES.

GEORGE SCHERR COMPANY, INC., 122 LAFAYETTE ST., NEW YORK, N. Y.

ward of drive pulley and projecting over belt.

Power is furnished, either by direct or V-belt drive from a 1/3 h.p. motor operating at 1725 r.p.m.

The unit operates in any position between horizontal and vertical, pivoting on center of drive pulley and locking into position by means of a positive clamp on base.

For wet surfacing operations, a sheet metal casing is fitted around machine. Coolant is piped to belt by a tube inserted through side of hood, ending in a spray nozzle which distributes coolant fluid evenly across the belt.

Screw Machine Instruction

Brown & Sharpe Mfg. Co., Providence, R. I., announce a series of 14 booklets to aid beginners in Screw Machine operation.

These booklets contain general operating descriptions and useful tables for Nos. 00, 0 and 2 sizes of Automatic Screw Machines, as well as helpful hints and full instructions for sharpening and adjusting all the commonly used tools.

Twelve typical Screw Machine jobs are covered—one to a booklet. Being in booklet form, the series is readily adapted to lecture or school use, and to encourage this method of training, B. & S. is offering a "Teaching Kit" with orders for 12 or more sets of booklets. This kit consists of complete machine and attachment specifications, "Construction and Use of Automatic Screw Machines," Booklet on Screw Machine Tools, and General Catalog listing B.&S. Screw Machine equipment.

The set of 14 booklets in a substantial indexed envelope is offered to Screw Machine operators and others interested in such work, at the nominal price of 50 cents a set, as it is felt that anyone having a real interest in the subject should be willing to make this small investment.

As the field covered includes adjustment and set-up for a variety of jobs, the booklets should be of considerable value to the more experienced operator as well as for the novice for which they are primarily intended.

The GLENNY
Adjustable-Expansion
BROACH

Produces low cost, accurate keyways. Eliminates set-up time. Self aligning. Interchangeable parts. Adapted for arbor press, mechanical or hydraulic pressure. Speeds up production. Cutter bars in carbon or high speed steel. *Details? Write!*

EAST SHORE MACHINE PRODUCTS CO.
833 E. 140th St., Cleveland, O.

Diamond Utility Press

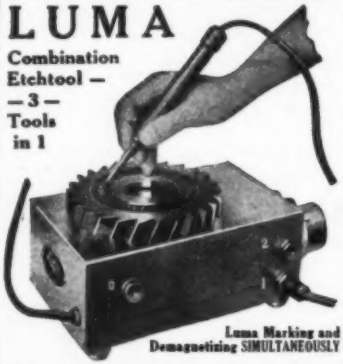
A new utility hydraulic press suitable for a wide variety of work has been introduced by Diamond Machine Co., Philadelphia.

Known as the "Diamond 40" it can be used for assembling, broaching, straightening, riveting, forcing and pressing operations.

The precision-machined steel ram is guided, steadied, and prevented from rotating for full length of travel by a crosshead riding on four rigid tension rods.

The press is powered by a high pressure Hele-Shaw pump. Oil tank, elec-

LUMA
Combination Etchtool — —3— Tools in 1



Luma Marking and Demagnetizing SIMULTANEOUSLY

Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact—easy to use—dependable.

Send for details—5-day FREE TRIAL OFFER!

Luma Electric Equipment Co.
Dept. H—Main P. O. Box 132, Toledo, Ohio

GOOD NEWS!
for DIE MAKERS

Transfer Points Eliminate Guesswork in Die Making

There's no chance for error when you use transfer screws as markers in setting dies. Points are of uniform height above hex base. Six accurately made and hardened screws nest in a special holder with hex wrench tip. Made in ¼" to 1" diameters.

3/16"	$1.50 per set	5/16"	$1.25 per set	7/16"	$1.40 per set
1/4"	1.20 " "	3/8"	1.35 " "	1/2"	1.50 " "

HEIMANN MFG. CO., **URBANA, OHIO**

Mechanics Through the Ages

DURING THE EARLY 1840'S, PLANERS WERE MOBBED AND DESTROYED BY CRAFTSMEN ANGERED AND ALARMED BY THE NEWS THAT THESE "NEW-FANGLED" MACHINE TOOLS WORKED ABOUT FORTY TIMES FASTER THAN THE OLD METHOD OF HAND FILING AND CHIPPING PLANE SURFACES
AS LATE, AS THE 1840'S THE ENGLISH WATCHMAKER'S IDEA OF "MASS PRODUCTION" WAS TO BUY WATCH MOVEMENTS "IN THE ROUGH", FARM OUT PORTIONS OF THESE MOVEMENTS FOR FINISHING TO THIS AND THAT CRAFTSMAN, AND DEPEND UPON THEM IN TURN TO SUBLET WORK TO SPECIALISTS IN FUSEE CUTTING, DIAL-MAKING, JEWELING, GILDING AND MOTIONING
WHILE SERVING AS U.S. MINISTER TO FRANCE IN 1785, THOMAS JEFFERSON VISITED A GUNSMITH NAMED LA BLANC WHO HAD SUCCEEDED IN DEVELOPING INTERCHANGEABLE PARTS FOR A GUNLOCK! THIS WAS 15 YEARS BEFORE ELIAS WHITNEY ASTOUNDED U.S. PATENT OFFICIALS BY ASSEMBLING 10 MUSKETS FROM A PILE OF MISCELLANEOUS PARTS. JEFFERSON HIMSELF ACTUALLY ASSEMBLED SEVERAL GUN LOCKS.

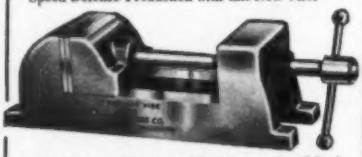
tric motor and hydraulic pump with controls are grouped and housed at top of press.

Gauges for oil system pressure, total pressure of piston and oil level, start and stop push buttons, hand lever and foot controls are at front of press.

The base is 12" high and has a 10" hole centered under the ram. A 16" Vee table is furnished with press but 6" and 10" Vee tables and a 12" extension table are available as standard accessories.

DOUBLE YOUR DRILL PRESS CAPACITY

Minutes are Seconds with the new TWISTITE Vise. Opens to full capacity in one second. Speed Defense Production with this New Vise.

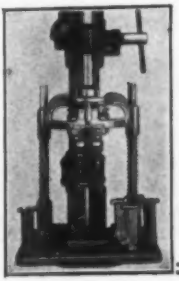


J. A. Richards Co., Kalamazoo, Mich.

LINCO *Two Spindle* Adjustable Drill Head

Also Adaptable for Tapping

Drills two holes at once, made in several sizes, drill centers ½" to 6", speeds up to 3600 RPM, capacity drills 0" to 5/16". Total weight of small head, with aluminum gear case, only 9½ lbs. Equipped with roller and ball thrust bearings. Especially engineered for Canedy Otto, Demco No. 15 and similar drill presses—also suitable for use on larger drill presses.



Descriptive Bulletin

Sent on request

LINDERME Machine & Tool Co.

12253 Coyle Ave.

DETROIT, MICH.

To operate, pull the hand lever forward or depress pedal for work stroke, and release for return stroke. The press has an automatic return. Speed of return stroke is double that of the approach.

Relief valves in oil circuit protect against overloading press with work. Electric motor is protected against overload by an overload relay.

Extreme travel of crosshead is limited by an adjustable follow-up stop.

Total daylight is 4' 6" without Vee table, 3'2" with standard Vee table. Diameter of ram is 4", stroke 24", maximum tonnage 40 tons. Overall height of press is 9' 7¾", floor space required 2'8"x3'8".

Defense Job Training Programs

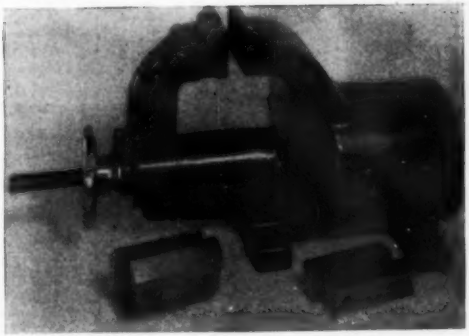
A condensed chart-guide to defense-training opportunities in programs sponsored by Federal agencies has been compiled and issued by the U. S. Office of Education.

The chart-guide, which measures 18 by 23", is entitled "Defense Job Training". It covers 24 training programs including vocational training for persons who have never had a job, advanced training for persons now at work, training of engineers, specialized instruction in radio and at cooks and bakers schools, pilot training—both civil and military—airport attendant preparation, and training for merchant marine ships' officers and crews.

Information which the chart-guide presents to persons interested in a defense job includes:—(1) Number to be trained or in training in fiscal year 1941; (2) wages in training; (3) fees in training; (4) wages on job; (5) purpose of training; (6) persons eligible; (7) length of courses, (8) where offered; (9) where to apply, and, (10) jobs for which training qualifies.

Single copies of the chart are 5 cents each. Bulk prices are $2 a hundred, $15 a thousand. Orders together with payments should be made to Superintendent of Documents, U. S. Government Printing Office, Washington, D.C.

Fastmatic Vise



As the name implies, this speedy vise has been designed for quantity production. It is fast because the jaws are mechanically operated in their closing and opening.

Smooth and rapid jaw traverse is obtained by oil or air pressure - operated piston, directly connected to the sliding jaw member. Holding power between fixed and movable jaw is regulated by pressure of piston. Air pressure at 80 to 100 lbs. is usually supplied. Oil pressure is obtained from the pumps on individual machines or from independent hydraulic pumps.

While movement of piston is approximately 1", various sizes of work are accommodated by setting the jaw in an initial position to the spacing desired, by an adjusting screw located on front end of vise. For repetitive work, the original initial setting is maintained, and the 1" movement in opening and closing of jaws is all that is required in inserting and removing the work.

Jaw operation is controlled by a hand or foot operated valve, although the latter is generally preferred.

Vises are available with a variety of hardened, soft or formed jaws, for many different types of work. Available in a number of sizes. They are made by Fastmatic Vise Co., 120 Boyleston St., Boston, Mass.

Hardinge Collet Bulletin

A new Bulletin No. 41 is the latest edition covering Hardinge Precision Collets for all makes of Lathes and Milling Machines.

Through the cooperation of the various machine tool builders, the Bulletin gives complete up-to-date information on the correct Collet adaptation for the different makes of Lathes and Milling Machines.

The proper name for each type of Collet, the maximum round, square and hexagon capacities, the major dimensions for identification purposes and prices are clearly presented in the bulletin.

Details are also presented in the bulletin indicating how the modern Sjogren Speed Collet Chuck can be adapted to Lathes and Milling Machines, together with the features gained by such an application.

MOREY VERTICAL SHAPERS

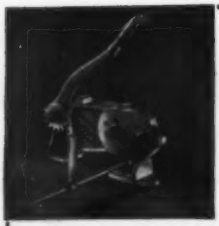
8" Stroke

12" Stroke

Accurate — simple for toolroom manufacturing. Self-contained motor drive.

Ask for Circular No. 726

Morey Machinery Co., Inc.
410 Broome Street, New York N. Y.



★ THE ★
WONDER
CUTTER

Small enough to go in any out-of-the-way place—yet it cuts wire and rods up to ⅝-in. round (⅜-in. square) and band iron up to ⅛-in. by 2-in.

Adjustable stop for gauging the length of pieces. Hardened cutters that last indefinitely.

Get the "dope" on the lowest priced cutter out—

THE WONDER

The Federal Foundry & Supply Co.
4602 East 71st St., Cleveland, Ohio

A New Hydraulic Pump

Hydro-Power Systems, Inc., Mount Gilead, Ohio (Division of The Hydraulic Press Mfg. Co.) announces a new larger size gear type hydraulic pressure generator. This Model "G"-60 gear pump has a delivery of 60 gallons of oil per minute at 1000 pounds per

square inch line pressure. The pump is of constant delivery type and is of extra heavy duty construction with flange connections. Close tolerances are maintained between working parts so that pump output efficiency is high.

Precision spur gears of narrow width and large pitch diameter are used. This reduces both the hydraulic load on the gears and the distance between the gear shaft bearings so that shaft deflection is minimized. Also with this design, higher working pressure can be obtained efficiently.

MADE OF ALLOY STEEL MILLED FROM BAR

SOCKET HEAD CAP SCREWS

SAFETY HOLLOW SET SCREWS

Try Them On Your Next Job!

ECONOMY MACHINE PRODUCTS COMPANY

5207 Lawrence Ave., Chicago, Ill.

ACROMARK TRADEMARK **FAST**

MARKING & NUMBERING MACHINES HELP YOU DO A GOOD MARKING JOB.

Write for latest catalog.

CONSULT OUR MARKING SPECIALISTS ABOUT ANY MARKING PROBLEM.

THE ACROMARK CORPORATION
259 No. Broad St. Elizabeth, N. J.

Faster Spot Welding Makes up for Man Shortage

Faster spot welding with Ace Spot Welders is providing many manufacturers with greater production per man-hour and increasing weekly output. Ease of operation makes possible quick development of expert operators.

Ace Welders are production tools designed for today's needs for steady, fast output. They are made in a range of capacities, both manual and automatic motor-driven types.

Write today for Catalog 40

PEER

ACE SPOT WELDERS

PIER EQUIPMENT MFG. CO.

1416 Milton Street, Benton Harbor, Mich.

---

for Aluminum and its Alloys

For Drawing, Forming and Pressing Aluminum Sheets

No. 22 Nonscratch Drawing Compound is a pigmented compound that has been used for many years by some of the largest airplane manufacturers. It is water soluble and may be used as is or when slightly diluted with water.

No. 4 Aluminum Drawing Oil is a viscous lubricant that does not squeeze out under great pressure when drawing aluminum.

For Machining Aluminum

No. 2 Aluminum Cutting Oil is a very thin oil that provides the necessary lubricating properties to insure the highest type of work—most perfect threads—clean holes, etc.

Write us for samples and service.

Wayne

CHEMICAL PRODUCTS CO.

9446 COPELAND AVE. DETROIT, MICHIGAN

Long bearing life and accurate positioning of pump gears are provided for and minimized by mounting gear shafts on precision Timken Tapered Roller Bearings. Internal adjustments provide compensation for bearing wear.

These pumps are used for a variety of applications. They serve as prime movers for hydraulically operated machines requiring medium pressures; as drives for auxiliary units; etc. Often they are used in conjunction with high pressure pumps to furnish large volumes of fluid at medium pressure to effect rapid traverse of the machine cycle.

The Model "G" is recommended for operation at 1000 pounds per square inch on application where peak pressures are "flash" or momentary; or for operating up to 500 pounds per square inch where peak pressures are maintained or held for any appreciable time.

Besides the new 60 gallon per minute pump, smaller capacity gear pumps are covered in Bulletin 402.

Motch & Merryweather Cold Saws

An eight page, three color bulletin is announced describing two sizes of the Motch & Merryweather Cold Sawing Machines. Attachments make these saws particularly adapted to sawing shell slugs. The company's new saw grinder and saw blades are also explained.

SAVE TIME
CUT COSTS
with
MOTO-TOOL
★
27,000 R. P. M.

At this high speed, Dremel MOTO-TOOL reduces cost of wheels, points, etc., on grinding, buffing, finishing and other daily shop operations. An indispensable tool for pattern shops, tool rooms and production departments. Ideal for exacting work in hard-to-get-at places . . . often saves time of tearing down and re-setting dies. Pays for itself on first job in many cases.
MOTO-TOOL is precision built for precision work. Has full bakelite shock-proof housing, oil-less (oil-sealed) bearings and built-in cooling fan. Weighs only 13 oz. Balanced armature eliminates vibration. Operates on either AC or DC 110-12 volt current. Sold by better dealers everywhere. Write for Dremel catalog and combination offers.

MASTER MODEL 2 ONLY $16.50

DREMEL MFG. CO., Dept. 211H, **Racine, Wis.**

TRICO OILERS
SAVE TIME—OIL—WORRY

No guesswork—bearing failures—waste—idle machine time—oil-soaked motor windings—fire and accident hazards, when you modernize with TRICO OILERS. There's a type for every application.

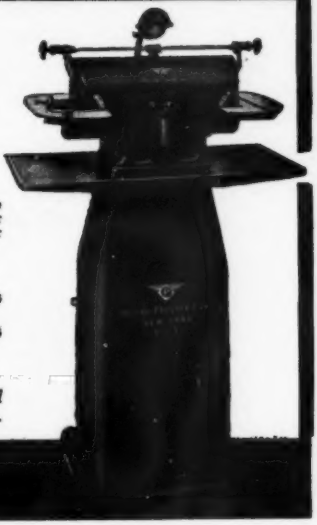
WRITE FOR BULLETINS.

TRICO FUSE MFG. CO. Milwaukee Wisconsin

CLOSED
TRADE AUTOM MARK
CLOSED
Plain Type
Offset Type
OPEN
OPEN
CONTINUOUS HINGES
All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.
AUTO MOULDING & MFG. CO.
2326 S. CANAL ST
CHICAGO
SPECIFICATIONS:
Open Width ⅜" to 6"
Gage Material .040 to .125
Pin Diameter .101 to ⅜
Lengths to 120"
THREE-FOURTHS OFFSET.
SEMI-OFFSET

Prosser

AVY DUTY
OL GRINDER



This machine has all the features of the smaller machine plus ample power for the heaviest tools.

- PROVISION FOR WET GRINDING.
- QUICK-ACTING INDEXING TABLES.
- HIGH GRADE BALL BEARING SPINDLE.
- DOUBLE V-BELT DRIVE.

Write for details of this and our other Carbide Grinders.

TO SPEED AIRPLANE PRODUCTION—This order of resistance welding machines for an Eastern aircraft manufacturer, is ready for shipment at the Detroit plant of Progressive Welder Co.

The M-B "Utility" Pneumatic Grinder. Model U.—T. R.

A 60,000 R.P.M. Unit

Steel Housing (For Safety)

A WORTHY COMPANION TO OUR *FAMOUS* "SUPER SPEED" MODEL S. S.—S. R.

SPECIAL GREASE SEALED BEARINGS NO LUBRICATION REQUIRED.

AN ABUNDANCE OF POWER.

OTHER MODELS, ALSO AIR LINE FILTERS AND AUTOMATIC AIR LINE LUBRICATORS.

Write for details and data on free trial offer.

M-B PRODUCTS

130 E. LARNED ST. DETROIT, MICH.

Export Office: 44 Whitehall St. New York, N. Y., U. S. A.

Interior Steel Equipment

Prompted by the National Defense emergency, the Interior Steel Equipment Co., 2352 E. 69th St., Cleveland, Ohio, has issued new catalogs which should be of interest to the machine tool industry. These catalogs include a large variety of styles and sizes of equipment which should be of interest for the handling, storing and filing of stock, records, etc.

The line includes many types of shelving, built on the unit principle. This permits adoption of the units needed at the present, and future extensions as required.

There are many types of cabinets, drawers, boxes and bins—special sloping shelf compartments for storage of milling cutter racks; portable bins, machine tenders, compartment boxes, etc. Numerous types of lockers are also offered.

NIELSEN

Heavy Duty

Live Centers

Write for catalog on live centers

Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

Work Wanted

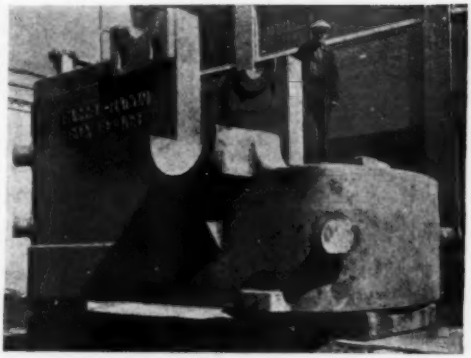
A NATIONALLY KNOWN MANUFACTURER OF PRECISION MACHINERY HAS FACILITIES FOR TAKING ON ADDITIONAL WORK for: W. & S. Turret Lathes, Boring Mills, Lathes, Punch Presses, Screw Machines, Precision Cylindrical and Internal Grinding, also Sub or Full Assembly Work.

BOX 142

c/o Hitchcock Publishing Co.

508 S. Dearborn St., Chicago, Ill.

68-Ton Meehanite Casting



This 68-ton Meehanite casting is one of the largest ever made in the Ansonia foundry of Farrel - Birmingham Co., Inc. The casting forms the bed of a stone crusher capable of reducing 4x4x5-foot pieces of rock to crushed stone for highway and building construction.

Meehanite was chosen for this 136,000 lb. casting because it provides the desired balance between performance, adaptability to machining requirements and production costs. Operating demands call for high strength and wear resistance in this severe service, and because of the necessity of machining the casting at the quarry, easy machinability was also an important requirement.

Molding was started Jan. 22 and a month later it was cast. Seventy-five tons of metal were melted for the casting and it was poured simultaneously from two ladles of 30 and 35 tons capacity, with a third ladle of 10 tons capacity finishing the pouring.

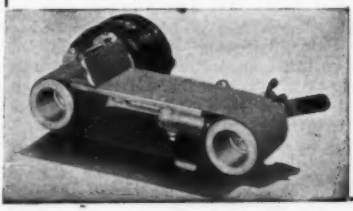
Only 10 minutes were required to pour the casting. It was allowed to remain in the sand for two weeks to cool properly. Another week was required to shake it out and clean it. Altogether, 29 men spent a total of 588 man-hours in the production of this casting.

A New Model by Foredom

Foredom Electric Co., New York, have added to their very complete line of flexible shaft tools, a new No. 400 Series. An innovation permits quick attachment of the flexible shaft and handpiece assembly to either the geared end for low speeds, or to the motor shaft direct for high speeds. Since, furthermore, a six-step foot-operated speed control is included with the tool, a speed range of from 500 to 14000 r.p.m. is obtainable.

The purchaser has the choice of five different handpieces, some as small as a pencil, and all having the quick-detachable feature, making it possible to use with the tool, just the right type for the work at hand. The manufacturer's new Bulletin 20 featuring this tool is now available.

AN INEXPENSIVE **ABRASIVE BAND GRINDER**



"Built Like A Machine Tool"

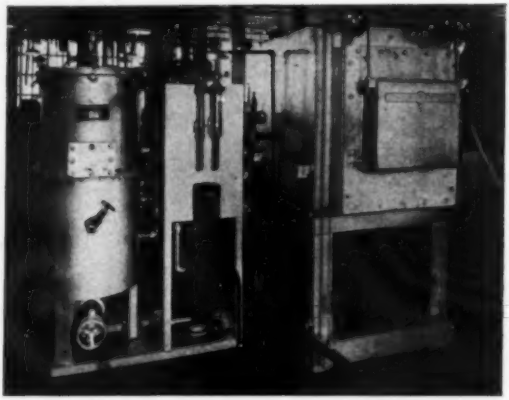
The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on belt. Ball bearing throughout, equipped with Alemite lubrication, complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

WALLS SALES CORP.
96 Warren St., New York, N. Y.

Heat Treating of Tools and Small Steel Parts

A new line of box-type furnaces for heat treating steel without scale or decarburization has been announced for the machine tool industry by General Electric Co., Schenectady, N. Y. The furnaces may also be used in industries where small steel parts must be heat treated at temperatures up to 2000°F.



The new furnaces are designed especially for use with drycolene, G-E's recently announced atmosphere gas for heat treating metals without decarburization or scale. Atmospheres other than drycolene may be used, however, with the amount of scale and decarburization dependent upon the type of atmosphere used.

Each furnace consists of a light-weight refractory lining backed by heat-insulating material, all enclosed in a welded, gas-tight sheet-steel casing. The door and furnace front are of machined cast iron, assuring close fit. Door on the largest furnace is motor-operated.

A high-velocity flame curtain prevents furnace from losing its atmosphere when door is open. A unique feature of the curtain involves mounting of the gas burner at top of furnace throat, so the flame curtain is shot down over the door opening, eliminating possibility of dirt dropping into and clogging the gas burner.

Uniform temperature is maintained by compensating heating units in front and rear of furnace, and automatically controlled power input to main heating unit.

Furnace Type 1227 has an internal width of 12", a working length of 27", and a door height of 8". The corresponding dimensions of Type 1530 are 15", 30", and 10"; of Type 1836, 18" 36", and 13". Type 2754 has an internal width of 27", a working length of 54", and a door height of 20".

Drycolene used in the new furnace is a mixture of gases consisting principally of nitrogen and carbon monoxide, containing no oxygen or carbon dioxide, and having extremely low water-vapor content. Decarburization is eliminated with drycolene, because the principal decarburizing agents are not present, and presence of carbon monoxide and nitrogen opposes the decarburizing action of any impurities in the atmosphere.

Ball Bearing Handbook

New Departure, Division of General Motors Corp., Bristol, Conn., offers the 15th Edition of their Handbook, listing the principal types and sizes of the Forged Steel Ball Bearings.

This book has a new finger index for quick reference and in addition to dimensions, capacities, tolerances, and mounting fits, contains new data to simplify the selection of bearings for various loads and length of service.

Copies will be furnished upon request for designers, draftsmen and others concerned with the selection and application of ball bearings.

Classified Section

USED AND REBUILT MACHINERY

Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 40c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

FOR SALE BY

Aaron Machinery Co.,
176 Lafayette St., New York, N. Y.

National-Acmes No. 53, 55, 56, m.d., 76 4 spdl. autos.
Gridley, Model F, 4 spindle, 3/".
Gridley, single spindle, 3½".
Borer, Rockford 3" horizontal.
Drills, radial, 3' Morris, 3½', 4' Mueller, m.d.
Eyeletting machines, United Shoe, Model B.
Gear hobbers, G. & E. and Shuchardt & Schutte, b.c.
Grinders Brown & Sharpe No. 1, 2, 13 universal.
Grinders, Bryant No. 6 internal.
Grinders, No. 55, 60, 65, Heald internal.
Hammers, Pettingell trip, No. 1, 2.
Lathe, 14"x8' Lodge & Shipley, grd. hd., 12 speed.
Lathe, 21x8' LeBlond, 3 step cone, heavy.
Lathe, Hendey 24x8', 9 speed, geared head.
Lathe, Hendey, yoke, 14", 18", 20".
Lathe, 24x10' Wickes Bros., q. c., 3 step cone, heavy
Lathe, 24x10' Crawford, 3 step cone, heavy.
Lathe, 24x10' Reed-Prentice, grd. head, m.d.
Lathe, 24"x14' Reed-Prentice, geared head.
Lathe, Pond 39x21'
Lathe, 18-36"x7'-10' Fay Scott, sliding bed gap.
21" Gisholt, 3½" hollow spindle.
Hardons & Oliver No. 2, 4.
Steinle 24", Universal, 6½", h.s., m.d.
Pratt & Whitney 2½x26" grd. head, s.p.d.
Miller, Cincinnati No. 4 plain.
Miller, Cleveland No. 1 plain, s.p.d.
Millers, B. & S., Cincinnati No. 2, 3.
Millers, Brown & Sharpe No. 12 production.
Miller, Cincinnati No. 3 Universal.
Miller, Jackson vertical, No. 10.
Shaper, Ohio 16", s.p.d.
Shapers, crank, 14", 16", 20", 26".
26" Libby, 7½" hole.
Turret lathes, Foster No. 7, (10).

The Reeve-Fritts Company
28 N. Clinton St., Chicago

Broach, No. 3 horiz., belt drive.
Centering machine, 4" Whiton, 2 spdl.
Die head, 2½" geometric, style D.
Grinder, Gisholt universal tool.
Hammer, 100 lb. Little Giant upright.
Lathe, 18"x8' Flather, l.c.g.
Polishing mach., Blevney, 6" band.
Saw, cold, No. 15, Lee-Simplex, 4½" cap.
Tapper, No. 1 Garvin vertical, ½" cap.
Turret lathe, 18" Lodge & Davis, b.g.

FOR SALE BY

Siegman Machinery Co., Inc.
561 W. Washington Blvd., Chicago, Ill.

Chip separator, 1 bu., motor drive, less motor.
Gear generator, 8A 14" Lees Bradner.
Generator, 18" straight tooth, Gleason.
Grinder, Greenfield hydraulic, No. 1—8"x18".
Grinder, rotary, Arter 8".
Grinder, tool & cutter, Cincinnati No. 1.
Grinder, tool & cutter, Wilmarth & Morman, No. 1.
Grinder, Bryant No. 10A.
Lathe, 15x6 Reed Prentice, grd. hd., m. d., t. a.
Lathes, Lodge & Shipley, 16x8, q c.g.
Lathe, 26"x12' Schumacher-Boye, quick change.
Profiler, single spindle, No. 4 Garvin.
Radial drill, American 3'.
Radial drill, Bickford 3½' m. d.
Shaper, 20" Rockford, m. d.
Thread cutter, Coulter auto. 6' g. h. 4"x24" s.p.d.
Please send us your inquiries.

Globe Machinery Co.
602 W. Lake St., - - - Chicago, Ill.

Boring bar, 3", Beaman & Smith horiz., floor type, gear box, motor drive.
Boring mill, 35½" Rogers vert., all grd. fds., 1 head on cross rail.
Broach, LaPointe-Hudson, No. 3, m. d., cut keyways to 1¼", bro. sq. holes to 3½" across flats, 54" stroke.
Planer, 25"x25"x6' Hamilton, 1 head on cross rail.
Planer, 36"x36"x16', 6" bed, Gray, 2 hds. on rail.

W. L. Steege Machinery Co.
548 W. Monroe St., Chicago, Ill.

QUALITY MACHINERY since 1916

Automatics, No. 8A Potter & Johnson, (2).
Drill, radial, 30" American, cone drive.
Grinder, Landis, 12x30 universal, cylindrical b.d.
Grinder, Van Norman, 6x10, cylindrical m.d.
Grinder, Heald, No. 60 cylinder grinder.
Grinder, Bryant No. 6 chucking.
Lathes, turret, Pratt & Whitney 3x36, hollow hexagon turret, power feeds to turret and cross slide, (2).
Lathe, 20x10 American, 3 step cone, q. c., complete.
Lathe, 24x14 New Haven, loose change.
Mill, No. 2Y Brown & Sharpe, rack feed.
Shaper, 26" Stockridge, single pulley drive.
Shaper, 24" Smith & Mills, cone drive.
Shaper, 7" Rhodes, cone drive.
Shear, universal circle and flanging, m. d. 12 gauge, 36" throat.

FOR SALE BY

C. R. Daniels
1514 W. Capitol Drive, Milwaukee, Wis

Band saw, No. 3 Atkins metal cutting, $200.00.
Grinder, 16x48", No. 23 Landis cylindrical.
Miller, 24"x11' Beaman & Smith, slab.
Shaper, rebuilt, 14" Steptoe, crank, single geared.
Shear, new No. 0252 Perzo 52" foot power, square.

B. D. Brooks Co., Inc.
119 Broad St. Boston, Mass.

Sheet metal working machinery, hand and power.
All types of new and reconditioned equipment.
Apron brakes, press brakes, shears, folders.
Bending rolls, corrugating rolls, forming rolls.
Punches, beaders, rotary machines, stakes, etc.

The Elyria Belting & Machinery Co.
Elyria - - - - - Ohio

Drill presses, 6 spindle National Acme.
Drill press, 4 spindle Allen.
Pump, Rumsey, 10½x10, 7½" inlet and outlet.
Rolls, corrugated, 32" belt drive.
Nut tappers, ⅜" and ½, National.
Turret lathe, J & L, sliding head.

W. P. Little Co.
2127 W. 89th Street, Cleveland, O.

Drill, 30" Prentice, sliding head, single pulley drive, tapping att.
Swaging machine, Aetna, capacity 1¼" tubing, 15" die length.

Jenkins Interlock Manufacturing Co.
443 N. Thirteenth St., Philadelphia, Pa.

Lathe, 12"x5' Davis, q.c., m. d.
Miller, hand.
Press, arbor, 25 ton.
Press, punch, 18 ton.
Turret lathes, 24"x24", G. H., J. & L. (2)

S. M. Regar Machinery and Mill Supplies
Tampa, - - - - Florida

Boring mill, Bickford, hor. spd., g. b., tbl. type No. 232.
Boring mill, Binsee No. 78 hor. knee type, 3½" spindle.
Boring mill, Niles 36" 2 swivel heads.
Drill, Barnes upright 20" 3 spindle, one tapping att.
Drill, Sigourney 4 spd. also various other upright drills.
Drill, radial, 5' Harrington.
Drill press, Foote Burt 24", heavy duty.
Hammer, Lingle 50 lb. power, arranged m. d.
Hammer, Little Giant 50 lb. power.
Keyseater, Morton 40".
Lathes, LeBlond 17" & 19" rapid prod. q. c. feeds, (3).
Lathes, National 18" production. (3).
Lathe, Gisholt, 24", hole in spindle 6".
Lathe, Bement Miles, l. c. g., 36" factory raising blocks to 42", centers 17', bed 22', c. d.
Lathe, Bullard 22", loose change, turret head.
Lathe, Mueller 20" quick change, 4 way tool post.
Lathe, Jones and Lamson 24x24".
Miller, Bement No. 68, rigid.
Pipe machine, Jarecki No. 18, 2½ to 16".
Pipe machine, Bignall Keeler, 3".
Saw, cold, Higley m. d. No. 27, 36", takes 30" blade.
Slotter, 16" Niles, circular table 36".

FOR SALE BY

Nesbitt Machinery Co.
110 E. Pratt St., - Baltimore, Md.

Planer, 22' plate, motor drive.
Guillotine shear, 6"x6" cap. Hilles & Jones.

Factory & Mill Supply Co., Inc.
176 Federal St., - Boston, Mass.

Milling machine, No. 2-M Potter & Johnson, auto.
Planer, 48"x48"x12' Betts, 3 heads, m.d.
Planer, 48"x48"x11' Pond Plainfield 3 heads, b.d.
Planer, 60"x60"x12' Pond, 2 heads, m.d.

Wiener Machinery Co.
237 Centre St., - New York City

Grinder, 6x18 Landis plain, self-contained, m. d.
Grinder, No. 12 B & S Universal tool & cutter complete.
Lathe, 24x10 Hendy, raised to 32".
Milling machine, No. 2 B & S complete with univ. eq.

Broadway Machinery Exchange
401 Broadway New York, N.Y.

Turret forming machine, No. 2 Brown & Sharpe automatic, complete with gears, cams, collets, countershaft. First class operating condition. Immediate delivery.

The Auto Equipment Co.
14th at Lawrence, Denver, Colo.

Grinder No. 2 Micro cylinder, serial 401-A. Has had reasonable use, but in excellent condition.

D. E. Dony Machinery Co.
47 Laurelton Rd., - Rochester, N. Y.

Drill, Demco 4-spindle, 12" overhang, m. d.
Gear hobber, No. 1 Adams.
Gear hobber, No. 4 Adams.
Press, No. 73½ Bliss, s. s.

Davis Machinery Company
1-3-5 St. Clair St. Toledo, Ohio

Filer, No. 3 Thiel, filing & sawing, m.d.
Gear cutter, 48"x12" Gould & Eberhardt, s.p.d.
Gear cutter, No. 3-36 Brown & Sharpe, s.p.d.
Gear generator, 5-A Lees Bradner, m.d.
Grinder, No. 16 B&S plain, 16"x72", b.d.
Hammer, 50 lb. "Little Giant" trip.
Keyseaters, No. 0 and No. 2 Baker.
Keyseater, No. 2 Mitts & Merrill.
Lathe, 32"x26½' Gleason, st. c. gear.
Lathe, 14x6' American, q.c.g., gd. hd., m.d.
Lathe, 19"x8' LeBlond, hy. duty, q.c.g., c.p.
Mill, A B Becker vertical, s. p. d.
Mill, No. 3 Hendey Norton plain, cone drive.
Mill, No. 1 Knight miller and driller.
Mill, No. 25 Becker plain, c. d.
Mill, No. 5-B Becker vertical, c.p.
Mill, 3" bar Lucas horizontal.
Press, No. 5-A Toledo O. B. I., back geared.
Press, No. 90-D Toledo, dbl. crank, m.d.
Shaper, 7" Rhodes, vert. & horiz. heads.
Shaper, 16" Newark, b.g. crank, s.p.d.
Turret lathe, No. 5 B. & O., power feed.

USED AND REBUILT MACHINERY

FOR SALE BY

Jones Machine Tool Company
Front & Pike Sts., Cincinnati, Ohio

LATHES

16"x8' Lodge Ship., q.c.
18"x8' Mueller, q. c.
18"x10' Monarch, q. c.
20"x10' Hamilton, q. c.
26"x12' Bridge'd, q. c.
30"x14' American, q. c.
28"x14' Boye & E., c. d.
36"x16' Pittsburgh, c. d.
32"x14' Amer., c. d.
No. 6 W. & S. turret.
Acme 14" turret lathe.
14" Pratt & W. turret.

MILLERS & SHAPERS

No. 3 LeBlond Uni. c.d.
No. 3½ Fox plain, c. d.
26" Kelley shaper, c. d.
24" G. & E. hi. duty c. d.
24" Cin'ti sgl. pul. drive.
20" Steptoe, cone drive.
18" American cone drive.
16" Smith & Mills, c. d.
24"x6' Gray planer, 1 hd.
36x36x16' Putnam planer.

MISCELLANEOUS

42" Bullard vert. boring mill, 2 hds. gr. fd., c. d.
No. 76 Toledo b. g.
No. 6 Bauroth o. b. inc.
No. 20C Bliss, O. B. Inc.
No. 2 R. & K. O. B. Inc.
No. C-3 Ferr. O. B. Inc.
No. 5-A Willard o. b. inc.
6' Fosdick radial, s. p. d.
2" Acme bolt cutters.
No. 1 LeBlond tool and cutter gr
No. 2 Davis keyseater.
No. 4 M. & M. keyseater.
23"–36" B & S. gr. cut.
Style "F" Baker hvy. dr.
60"x10 ga. Bertschshear, 18" gap.

ONLY A FEW—LET US KNOW YOUR WANTS

FOR SALE BY

Shepler Manufacturing Company
1312 Sheffield St. Pittsburgh, Pa.

FOR SALE—SHEET COPPER

888 lbs. 12 oz. (.0162) x 10" wide, cold rolled copper suitable for polishing, in rolls.
1,116 lbs. 12 oz. (.0162) cold rolled copper suitable for polishing, in flat 11-7/8"x10".
618 lbs. 10 oz. (.0135) copper corrugated, in cut sizes ranging from 7¼"x9¾" to 11¾"x22¾".
878 lbs. 10 oz. (.0135) copper, triangular shape pieces.

E. L. Klauber Machinery Co.
3221 Olive St. - - St. Louis, Mo.

Gear hobber, No. 000 Schuchardt & Schutte.
Grinder, 5"x18" Ott plain cylindrical, b. d.
Lathe, 14"x7' Hamilton, taper attchmt., and collets.
Lathe, 14"x8' Fay & Scott, gap bed, draw-bar, m. d.
Milling machine, Type OY Brown & Sharpe, plain.
Press, No. 60N Bliss o. b.i., double action, roll feed.
Radial, 24" Carlton, high speed, belted.
Shapers, 16"-20" Ohio, 20" Cincinnati.
Slotter, die, Universal, 10" rotary table, 2" stroke.
Testing machine, Rockwell, No. 5 H-40.
Threading machines, Landis, 2" single head.
Turret lathes, No. 3 Dreses, g.f.h., 1¼" bar feed.

West Penn Machinery Company
1210 House Building, Pittsburgh, Pa.

Air compressors, 30 to 2500 cubic feet.
Air compr. portable gas 1-R 180 cu. ft.
Blower, No. 4 Roots, capacity 2110 c. f. m.
Bolt cutters, 1½" 2" & 3" Acme, b. d.
Boiler, 45 h p. Titusville 110 lb. pressure.
Boring mill, 34" Colburn, turret hd., b. d.
Bulldozers, Nos. 2, 4, 6, 9, 28, & 30.
Crane, 5 ton alliance, 35' span.
Crusher, jaw, No. 4 Champion, b. d.
Die filer, No. 3 Thiel, m. d.
Drill sharpener, Ing.-Rand "Leyner", 1½".
Drill, radial, 5' American, semi-univ., b.d.
Drills, upright 10" to 36".
Drill, No. 216 Baker, No. 5 M. T., b.d.
Engine, gas, 20 horse power Bessemer.
Gear cutters, 11" 18" & 24" Gleason.
Gear tester, bevel 18" Gleason.
Grinder, "Kwick-Way" all purpose, m.d.
Grinder, drill, No. 31 Oliver, 1½", m. d., 220/3/60.
Grinder, internal, No. 60 Heald, b.d.
Grinder, knife 10' Bridgeport, m.d.
Grinder, roll, Farrel 30"x16"
Grinder, surface vertical, 30" table, 16" wheel, m.d.
Grinder, No. 2 Walker tool & cutter, b.d.
Grinder, No. 13 B&S tool & cutter, b.d.
Grinder, No. 2 tool & cutter, Greenfield, b.d.
Grinders, D. E. 2—3 & 5 h. p., 220/3/60
Hammers, 50 lb., 75 lb., 100 lb., 200 lb. Upright.
Hammers, Nos. 2-B, 3-B, 4B, 6-B, Nazel.
Hammers, steam, forging & drop.
Keyseater, No. 1 Davis, 1"x8", m.d.
Keyseater, No. 1 Baker 1½"x12", b.d.
Lathe, precision, No. 3½ Rivett, b.d.
Lathe, bench, 11"x4' South Bend, m. d.
Lathes, speed, 11" and 13" Blount, m. d.
Lathe, brass 18x6", friction head, power feed, b. d.
Lathe, 16"x12' Rahn-Larmon, geared head, t. a.
Lathe, 18"x12' Hendey, grd. head, t. a.
Lathe, 20"x10' Springfield, t. a., m.d.
Lathe, 24"x10' Lodge & Shipley, q.c.g., d.b.g.
Lathe, 26"x18" Pittsburgh, d b.g., t.a., b.d.
Lathe, 42"x16' Schumacher Boye, q. c. g., belt drive.
Lathe, Lo-Swing, 6"x60", s. p. d.
Lathe, roll, 42"x20' United, m.d.
Lathes, turret, Nos. 1, 2 and 3 W. & S., b. d.
Lathe, turret, 2 spindle, J.&L., 2-1/8", m.d.
Lathe, turret H-21" Gisholt, 24", b.d.
Locomotive, gas, 6 ton Milwaukee, 36".
Miller, shaper, duplex, No. 14 Cochrane-Bly, m.d.
Miller, Lincoln No. 32 Kempsmith, b.d.
Miller, Lincoln, No. 5 Hendey, b.d.
Miller, vertical, Burke, table, 16x6, b.d.
Mixers, Sprout-Waldron, batch & liquid.
Nibbler, No. 1 Campbell 3/16", 6" gap, m. d.
Nibbler, L.&A., ¾"-36" throat, m.d.
Pipe mchs., 2", 4", 8" 8"12"&16" Landis-Oster-Williams.
Planer, 24"x24"x6' Gray, 1 head, b.d.
Planer, 30x30x10 Gray, 1 head, m.d.
Planer, 39"x36"x12" Cincinnati, 2 hds., b.d.
Press, forging, 150 ton United, steam hyd.
Press, toggle, 525 ton Garrison, b.d.
Press, screw, No. 87 Niagara, hand power.
Press, strip feed, No. 31-C McDonald, b.d.
Pumps, centrifugal 6", 4", 1", motor drive.
Punch, EF Cleveland, 36" throat, 1¼" thru 1".
Punch, multiple, 32E W & W, 10' 3".
Riveters, air, hammer, spinning.
Rolling mill, cold 9"x18" motor drive.
Saws, friction, Nos. 2, 3 & 4 Ryerson motor drive.
Saw, metal band, Laidlaw, m.d.
Shapers, 16", 20", 24" & 36" Gould & Eberhardt.
Shears, alligator, 1½", 2", 3", 4" & 6".
Shear, Angle 6x6x½ Long & Allstatter, m. d.
Shear, Niagara 42"x14 ga., belt drive.
Shear, Stoll 60"x3/16", motor drive.
Shear, 84"x1" H. & J. 36" gap, m.d.
Shear, guill, No. 2 H. & J., 3½" rd. b. d.
Shear, guill., 4'x4" Newbold, b.d.
Shear, throatless, No. 114-M Marshalltown, ½", m.d.
Shear, up-cut, 22" Aetna, m. d.
Slotter, 54" vertical, Morton, m.d.
Straightener, 60" McKay, 17 rolls 4½", m. d.
Straightener, 84"x1" Bertch, m.d
Testing machine, 400,000 lb. Riehle, b. d.
Tumbling barrel, 34"x48", belt drive.
Upsetters, 1" to 6".
Welder, spot, 13 K. V. A.

FOR SALE BY

Lloyd Machinery Inc.
150 Broadway New York, N. Y.

Boring mill, 42" Gisholt, 2 heads, m.d., rap. power tr.
Gear generator, 11" Gleason, auto. bevel, s.p.d.
Grinder, 84" Diamond, wheel diam. 30", m.d.
Lathe, turret 18" Libby Model A, s. p. d.
Planer, 60"x60"x10' Cincinnati, dbl. std., 2 hds., m.d.
Slotter, 24" Newton, table diam. 42", m.d.

Nelson Machinery Co., Green Bay, Wis.

Brake, Keene 10' Cornice, No. 114.
Compressor, LeRoy Model 2S, size 315 CFM, direct m.d., 75 h.p., 3-60-220/440-860 RPM.
Drill, 28" Barnes, sliding hd., H.W.L.&G. p.f., bd.
Lathe, 14"x8' L. & S., q. c., 56" centers, s. b. g.
Lathe, 16"x10', Rockwell, l. c., 78" centers, d. b. g.
Lathe, 20x12' American, s.b.g., l.c., belted.
Lathe, 22"x10' Schumacher, Boye, l. c., 72" cent., s.b.g.
Planer, American, 28x28x8', one head, belted.
Planer, Ohio, 36x36x8', 2 heads, belted.
Punch, Reade, 36" throat, plain, m.d.
Shear, No. 2 Lennox bevel, capacity ½".

Standard Machinery Co.,
347 Indiana Ave. Grand Rapids, Mich.

Automatic, ½" Cleveland, single spindle.
Drill, 28" Superior, sliding head.
Drill, 40" New Haven No. 5, sliding head.
Extractor, DeLaval, size No. 26.
Gear cutters, Whiton No. 14 automatic, (2).
Grinder, cylinder, Heald No. 65.
Lathe, 24"x8' Lodge & Shipley, q.c.g.
Lathe, 2"x24" Jones & Lamson, flat turret.
Tapper, Anderson No. 40 Dial Feed Auto.
Welder, Expert Portable spot, 50 KVA.
Welder, Thompson Spot 25 KW, foot operated.

D. H. Prutton Machinery & Tool Co.
5295 W. 130th Street, Cleveland, Ohio

Air compressor, 50 cu. ft., Allis Chalmers, m. d.
Bolt pointers (two), Economy ½"
Boring mill, Bullard 24", 1 turret head on rail, 1 square side head, No. 6028, rapid production.
Box printer, single color, Hall & Brown.
Broach, No. 2 Lapointe, 2 spindle.
Chucks, 35-6"x9" Heald magnetic.
Chuck, 1-12"x48" Heald magnetic.
Drill, No. 2 Avey matic 2 spindle.
Drill, 4 spindle Demco, b. b., p. f. single pulley drive.
Grinder, disc, No. 50 Gardner, m. d.
Grinder, disc, No. 50 Gardner, semi auto., with fixture for grinding edges of electric iron bottoms.
Grinder, disc, No. 14 Gardner.
Grinder, disc, No. 120 Gardner.
Grinder, disc, 22" Gardner, m. d.
Millers, (two), No. 12 B. & S.
Pipe threader, 4" Bignell Keeler.
Pipe threader, 2" Oster.
Planer, 36x36x10 Woodward & Powell 1 head on rail.
Plate, polisher, No. 27L Excelsior, m. d.
Press, No. 1 Bliss cam drawing, s. s.
Press, No. P2 Ferracute.
Press No. 65 Consolidated, s. s., flywheel type.
No. 0-36 Unishear, m. d., less motor
Manville four slide, hand feed, cap. ⅜x1.
Tappers, vertical (two), 5 spindle Webster & Perks.
Tapper, No. 2 Garvin.
Tappers (two), 3/8" Rickert Schafer.
Thread roller, 2/8 Waterbury.
Threader, 2 spindle, 1" cap., National Acme.

FOR SALE BY

Wisconsin Gear & Engineering Co., Inc.
602 So. 2nd Street, - Milwaukee, Wis.

Gear generators, Bilgram bevel, 6" & 16", guaranteed to be in A-1 condition with all change gears and segments.

Foster Machinery Co.
3982 Bluestone Rd. Cleveland, O.

Bulldozer, Williams & White No. 4, double end.
Forging roll, No. O.C. Ajax.
Lathe, 13x6, South Bend.
Punch, Long & Alstatter, 36" throat, 12" cap. arch jaw.
Saw, 6" Newton, cold.
Saw sharpener, 11S Cochrane & Bly.
Welder, ¾" butt.

The Nutmeg State Machinery Corp.
1041-1051 State St., New Haven, Conn.

Boring mill, Espen Lucas No. 26, 4" bar with ex. table.
Grinders, Bryant No. 30, chucking, 35" swing, motor driven by 3 motors, (3).
Grinder, Brown & Sharpe No. 2 universal.
Grinder, Cincinnati, 12"x36" universal.
Thread millers, Pratt & Whitney 6"x48", complete with gears, pumps, tanks, countershafts, (2).
Turret lathe, Pratt & W. 2½x26", grd. hd., complete.

Ashley F. Ward, Inc.
2968 Jessamine St., Cincinnati, O.

Manufacturers of Bakery Machinery & Pans.

We have for sale, the following good used tools on production work.
Grinder, Gardner double disc, No. 120, with 18" discs.
Milling machine, No. 4 Becker-Brainard, universal, with 5' table.
Shear, 5' Robinson.

Alex Zeeve
2282 Woolworth Bldg., New York, N. Y.

Bolt threader, 2" Acme "Class A", lot of dies.
Boring mills, vertical, 51" Bullard, 3 heads, m.d., 24" Rogers, spd.
Cylinder boring mill, horiz., 7" bar, for cylinders up to 96" diameter.
Gear hobbers, 24" Rheinania; 18" Schuchardt-Schutte.
Hammers, power, 500 (2), 400 and 75 lb. Beaudry "Champion".
Hammer, steam, 250 lb. Niles-Bement-Pond, agle. fr.
Keyseaters, No. 3 & No. 2 Mitts-Merrill, No. 2 & No. 1 Baker.
Lathes, 39"x20' Rahn-Mayer-Carpenter semi-q. c.; 30"x13' H. S. & G., q. c.; 29"x16' Walcott, q. c. g., taper.; 24"x16' Whitcomb-Blaisdell, q. c. g.; taper, 24"x11' Lehmann, 16 speed gd. hd., md. taper.; 21"x12' LeBlond, 12 speed gd. hd., m.d., taper.; 20"x10' Lodge & Shipley, q.c.g., dbg. bowl head, 16"x6' Kimball-Walcott, 12 spd. gd. hd., spd., others.
Miller, No. 6 Whitney, hand, m.d.
Planers, 36"x36"x16' Woodward-Powell, 1 rail head, 1 side head; 24"x24"x8', Cincinnati.
Roll, pyramid, 10'x3" Hilles & Jones, drop-end, m.d.
Saw, 6"x6" Avey "Milband", arr. m.d.
Shaper, 20" Steptoe, heavy duty, b.g., cone.
Shears, 8'x3/4" Lennox, rotary splitting, m.d., ¼" capacity Ryerson throatless.

ALSO MANY OTHER TOOLS.

USED AND REBUILT MACHINERY

FOR SALE BY

Lang Machinery Company — **28th St. & A. V. R. R.** — **Pittsburgh, Pa.**

Air compressor, 9"x10" Ingersoll-Rand "ER-1", b. d.
Air compressors, Ingersoll-Rand XB-2, 600, 885, 1200 & 1800 cu. ft. 100 lb. pressure, motor drive.
Air comp. 14"x12" Ing. Rand "ER-1", 464 c. f., m. d.
Bolt cutter, 1" Landis, 1⅛"-3" sq. hd., b. d.
Bolt cutters, 1" Acme, Landis hds., 2 & 3 spdl.
Boring mill, 36" Bridgeport, grd. feeds, m. d.
Boring mill, 42" Bullard, 2 swivel heads, b. d.
Boring mill, 72" Colburn, 2 heads, r. p. t., m. d.
Boring mill, 8' Betts, 2 hds., grd. feeds, b.d.
Boring mill, horiz. 2½" bar N. B. P., knee type, b. d.
Boring mill, horiz. 3½" bar D & H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Brake, 8'x12 gauge D & K leaf type, s.p.d.
Bulldozers, No. 2 & No. 4 Wms. & White, m.d.
Column facer, 30" dia. Espen Lucas, b.d.
Drill, mult. No. 3 Rockford 3 spdl., s.p.d.
Drill, mult. 10 spindle D-12 Fox, b. d.
Drill pointer, Sellers, m. d.
Drill, radial, 3½" Prentice, t. a., b. d.
Drill, radial, 3" Bickford, t. a., m. d.
Drills, upright, 11" to 34", b. d. & m. d.
Gear cutter, spur, 30"x16", B. & E., m. d.
Gear cutter, spur, 84" Newark, m. d.
Gear planer, 84" Gleason, bevel, m. d.
Generator, 100 KW Westinghouse d. c., 125 v. b. d.
Generator, 150 KW Jeffrey, d. c. 250 v. b. d.
Grinder, disc, 18" Diamond, dbl. end.
Grinder, dbl. end, Standard Elec. 7½ H. P. 220 v. d. c.
Grinder, gear tooth, Detroit No. D-12, m. d.
Grinder, internal cylinder, No. 5 Landis, b. d.
Grinder, piston, No 2 Van Norman, b. d.
Grinder, tool & cutter, Ingersoll inserted tooth, m.d.
Grinder, univ., No. 5 B. & S., 20"x72", b. d.
Grinder, No. 60 Heald, b. d.
Hammer, power, 300-lb. Bradley, upright helve.
Hammer, power, No. 4 Beaudry, b. d.
Hammer, 1800 lb. Bliss, board drop, b.d.
Hammers, steam drop, 400-lb. to 8000-lbs.
Hammers, steam forging, 800 lbs.—6000 lbs.
Keyseater, No. 3½ Baker, 3½", m. d.
Lathe, 10"x5' Seneca Falls, p. c. g. b. d.
Lathe, 14"x6' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 15"x8' Sidney, q. c. g., d. b. g., b.d.
Lathe, 15"x10' Sebastian, p. c. g., s. b. g., b. d.
Lathe, 15"—24"x8' Sebastian grd. head, m. d.
Lathe, 16"x8' Pratt-Whitney, p. c. g., b. d.
Lathe, 16"x10' Bradford, grd. head, q. c. g., m. d.
Lathe, 16"x24"x8' So. Bend, gap, b.d.
Lathe, 17"x6' LeBlond, automobile, b. d.
Lathe, 17"x8' LeBlond, q. c. g., d. b. g., b. d.
Lathe, 18"x6' American, q. c. g., d. b. g., t. a., b. d.
Lathe, 18"x8' Prentice, p. c. g., t. a., b. d.
Lathe, 18"x8' Carroll, d. b. g., q. c. g., b. d.
Lathe, 18"x8' Prentice turning, d. b. g., p. c. g., b. d.
Lathe, 18"x10' Hendey, q. c. g., b. d.
Lathe, 18"x8' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 20"x8' American gd. hd., q. c. g., m. d.
Lathe, 20"x10' Hamilton g. d. head, q. c. g., s. p. d.
Lathe, 24"x12' American grd. head, m. d.
Lathes, 26"x11' Wickes hvy. duty comb. Eng. & Tur.
Lathe, 27"x11' LeBlond, grd. hd., q. c. g., d. b. g., m. d.
Lathe, 27"x12' Putnam, hvy. duty, q. c. g., d. b. g., b. d.
Lathe, 27"x18' Sidney, d. b. g., q. c. g., b. d.
Lathe, 32"x14' S. & B. hvy. duty, d. b. g., q. c. g., b. d.
Lathe, 32"x16' Schumacher & Boye, p. c. g., d. b. g., b. d.
Lathe, 36"x10' American, p. c. g., t. a., b. d.
Lathe, 36"x26' 6" New Haven, p. c. g., b. d.
Lathe, 36"x48' N. B. P. turning, grd. head, m. d.
Lathe, 40"x16' Fifield, trip. grd., int. face plate d., b.d
Lathe, 42"x 20' Springfield trip. grd., p. c. g. b. d.
Lathe, 46"x 17'7" Pond, triple grd., p. c. g., b.d.
Lathe, 48"x22½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, 48"x26½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, 60"x20' Niles, b. gb.d.
Lathe, gun boring, 2 bar, cap. hole 12"x40', m. d.
Lathe, turret, 16" Warner-Swasey, h.s. 1 7/16", b.d.
Lathe, turret, 18" Reed, h.s., 1¾", p. f., b. d.
Lathe, turret, 3-A W & S, h.s. 3½", m.d.
Lathe, turret, 18" Libby "A", h.s. 3-9/16", m.d.
Lathe, turret, 26" Libby "C", h.s. 7½", s.p.d.
Leveller, 84" Bertsch 7 rolls, m. d.
Leveller, plate, 48" McKay, 17-roll, m. d.
Miller, duplex, 36"x32"x10' Ingersoll, m. d.
Miller, hand, No. 3 Rockford, table, 18"x48".
Miller, plain, No. 2-A Milw. tbl. 48"x12", s. p. d.
Miller, plain, No. 5-C Becker-B., tbl. 60"x16", b. d.
Miller, slab, 30"x24"x12' Ingersoll, adj. rail, m. d.
Miller, Vert. Taylor & Fenn, tbl. 20½"x6", m. d.
Miller, vertical Niles, table 42" dia. b. d.
Pickling machine, Mesta, 8-12' arms.
Pipe machines, Landis ½" to 2", belt drive, (2).
Pipe machines, 8" Williams, 2½" to 8" motor drive.
Planer, 24"x24"x8' Lodge-Davis, 1 head, b. d.
Planer, 24"x24"x5' New Haven, 1 head, b.d.
Planer, 30"x30"x8' Cincinnati., 2 heads, m.d.
Planer, 36"x36"x10' American, 2 heads, m. d.
Planer, 36"x36"x11' Sellers, 2 heads, rev. m.d.
Planer, 36"x36"x14' Gray, 4 heads, b.d.
Planer, 48"x48"x30' Putnam, 3 heads, m. d.
Planer, 54"x54"x20' Pond, m. d.
Planer, 56"x56"x10' Gray, 4 heads, b.d.
Press, double acting, No. 1 Bliss, roller feed,
Press, hydraulic, 100 ton, Watson-Stillman, m. d.
Press, forging, 1500 ton Farrell-Birmingham, m.d.
Press, o. b. i. No. 68-C Bliss, stroke 5".
Press, perforating, No. 5 V & O, str. 4", dbl. crk., b.d.
Press, straightening, Hunt hydraulic, 50 tons.
Profiler, No. E3, Keller, motor drive.
Punch, lever, No. 58 Niagara, 36" throat.
Punch, mult. 10' L. & A. cap. 340 tons.
Punch & shear, No. 9 L. & A., rap. act. 4"-⅝".
Punch & shear, Cleveland E1 1¼" thru 1", m. d.
Punch & shear, Cleveland "G", 2" thru 1", m. d.
Punch & shear, dbl. end. No. 00 Covington, 2"-1", m.d.
Saw, band Type JM Laidlaw, cap. 6", m. d.
Saw, band 26" Crescent, tilting tbl. 20"x24", b. d.
Saws, hack, 4"x4", 6"x6", 9"x9", 12"x12", b. d. & m. d.
Saw, cold, Espen Lucas, blade 22", cap. 6" rd.
Saws, 20-B Racine, cap. 60"x6", m. d.
Screw machine, Pratt & Whitney, cap. 1", b. d.
Shaper, 16" Steptoe, b. g., b. d.
Shaper, 16" Cincinnati, b.d.
Shaper, 16" Gould & Eberhardt, b.d.
Shaper, 20" Cincinnati, d. b. g., b. d.
Shaper, 21" Smith and Mills, high duty, b.d.
Shaper, 24" American, high duty, b.d.
Shaper, 24" Cincinnati, m.d.
Shear, allig. Pittsburgh, cap. 2"-2½", m. d.
Shear, allig. No. 7 United, 6" square, m. d.
Shear, alligator, No. 61 Carlin, 3" round high knife.
Shear, bar, Mesta 36"x1½", m. d.
Shear, circle, No. 05 Niagara, b. d
Shear, flying, Edwards, capacity 10 sq. in.
Shear, plate, 10'x¾" American, m.d.
Shear, plate, 119"x¾" Wheeling, gap, 15", m.d.
Shear, plate, 10'x¾" Pittsburgh, gap, 15½", m. d.
Shear, plate, 125"x3/16" Hyde Park, gap 15", m.d.
Shears, plate 156"x3/16 Hyde Park, gap 17", m. d. (2)
Shear, plate 156"x3/16" Standard, gap 15", m.d.
Shear, plate 8'x1" United, m.d.
Shear, plate, 96"x1¼" Morgan, m.d.
Shear, plate, 132"x1¼" Morgan, m.d.
Shear, squaring, 60"x16 ga. Pexto, m.d.
Shear, squaring, 72"x18 ga. Streine, m.d.
Shear, rot. No. 10-M Marshalltown throatless, 10 ga.
Slotter, 18" Bement, table 36" b. d.
Slotter, traveling, Morton, stroke 54", m.d.
Slotter, die Garvin, str. 30", tbl. 12" dia., m.d.
Sprue Cutter, No. 7 Z & H, cap. 50 tons.

(Continued on next page)

USED AND REBUILT MACHINERY

FOR SALE BY

Lang Machinery Company — **28th St. & A. V. R. R.** — **Pittsburgh, Pa.**

(from preceding page)

Straight'ner, strip. & cut. No.1 Schuster, 2½"x¼", m.d.
Straight'ner, shape, No. 3 Sutton, 3-way, cap. 3½", m.d.
Tapping machine, duplex Garvin 2-X, ½"-1", b.d.
Thread Miller, Smalley-General, cap. 14"x3", m.d.
Vertical attachments Nos. 3 & 5 Cincinnati millers.
Welders, 150 amps, 200 and 300 amps, portable.

Machine Tools Sales Company
513 N. 17th St., Philadelphia, Pa.

511' 15x9x10 Chi. pneu. O-CB, mtr. dr,
Auto. 6-A Potter & J., (2).
Auto. 2", Model B. Cleve., Ser. over 33,000.
Auto., 5/8-7/8" Model A Cleve., Ser. over 30,000.
Bor., No. 3, 6" bar Barrett hor., cyl., m.d.
Drill, radial, 8' Sellers, m.d.
Grinder, 10"x36" Landis pl. self-cont.
Grinder, No. 2 Landis univ. 12"x32" c-shaft.
Grinder, 7-5/8x16" Sichel hob.
Lathe, 27"x38' Lodge & Shipley, m.d.
Lathe, 26"x14' Bridgeford pl. turn., m. d.
Lathe, 20"x8' Prentice, gd. hd.
Lathes, 20" x8' Springfield mfg., (2).
Miller, No. 3½, 72" Pratt & W., dble. spdl.
Miller, No. 2 M Potter & J. mfg., s.p.d.
Miller, Putnam Mfg.
Miller, thd. 11"x24' Milled Screw Co.
Planer, 54"x54"x15'6" Sellers, 3 hds.
36"x36"x14' Hamilton, 3 hds.
Planer, 22" No. 2 Hilles & J., plate.
Punch, No. 6 Hilles & J., 62" throat.
Saw, 9"x9" Peerless hack.
Slotter, or vert planing machine, 73" Newton. m.d.
Slotter, 14" Betts, crank.
Slotter, 12" Bement, crank.
Strip mill, 16"x24" Bliss 2-hi., cold.
Tire setter, No. 6 West hydr., 18 cyl. 30" to 63" with Triplex pump.
Trucks, 6000 lb. cap. Tier Lift Trucks, Baker, Automatic Transportation, Lakewood (4).

Joseph Hyman & Sons,
Tioga and Almond Sts., Philadelphia, Pa.

WORLD'S LARGEST STOCK
POWER PRESSES

No. 4 United Eng. & Fdry., 4 crank, 156" between uprights, 6" dia crank 7½" stroke, weight 118000 lbs.
No. 65E Niagara, gap, grd., double crank, 72".
No. S 126 Ferracute, dbl. crank 124", crank 7½"—9".
No. 105 Consolidated gap, d.c.
No. 106 Bliss gap, double crank, geared.
Nos. 92B, 91C. Toledo double crank presses.
No. 56½ Consolidated, geared.
Nos. 74½, Bliss straight side.
No. 34B Bliss toggle.
No. 14 Bliss, toggle press.
No. 164½ Toledo, toggle press, tie rod.
No. 164½ Toledo toggle press.
Nos. PA3 Ferracute & 13 Toledo horning.
No. 25½ Bliss-Consol. horning.
No.662 Toledo, 250 ton knuckle joint, coining.
75 ton EG51 & E51 Ferracute.
800 & 600 ton American Can.
250 ton & 150 ton Waterbury Farrel, coining.
No. 23 Bliss, 250 ton, knuckle joint.
150 ton EG52 Ferracute, knuckle joint.
Hammer, No 4B Nazel, m d.
Punches & shears, single & double end.
Squaring shears, various sizes.
These and hundreds of others of popular makes and sizes, are in stock at our warehouse here.
Rebuilt and Guaranteed.

Wm. C. Johnson & Sons Machy. Co.
1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Bolt threaders, 1", 1½" & 2" Acme.
Boring mill, Niles, 6-ft.
Brake, press, L&N, 10', 10 ga.
Drill, Naico 13 spindle, No. 1 taper.
Drill, No. 2 Fox, 6 spindles.
Drills, radial, Dreses, 3' & 4'.
Drills, radial, Fosdick, 3'.
Drills, radial, Drillmaster, new.
Forging machine, Ajax 2".
Grinders, 10"x36" Landis.
Grinder, Walker 12" rotary.
Hammers, 300 lb. Beaudry, 75 lb. Bradley, 50 & 100 lb. Little Giant.
Lathes, 14"x6' Monarch, q.c.g.
Lathes, 14"x6' American, q.c.g.
Lathe, 18"x8' Amer. q. c. g.
Lathes, 20x8' Le Blond, q.c.g.
Lathes, 24x16' Lodge & Shipley, q.c.g.
Lathes, 26—48x18' McCabe 2 spindle.
Lathe, 32"x14' Schumacher & Boye.
Lathes, 80x14 New Haven.
Lathes, 82" Niles locomotive wheel.
Miller, No. 3 Knight vertical.
Miller, No. 0 Steptoe.
Miller, No 2½ Fox.
Pipe machines, 2"—4"—6"—8"—12".
Pipe machine, 2" Landis.
Planer, Cincinnati 2 heads, m. d.
Potter & Johnson 5 A auto.
Press, wheel, 400 ton 84" Niles.
Press, wheel, 200 ton 48" Niles.
Punches, shears, bulldozers.
Roll, plate straightening, H. & J. No. 2, like new.
Rolls, 16' Whiting, 12" & 9½" rolls.
Rolls, 12' Pyramid, 14" & 16" rolls.
Saws, 6x6 Peerless. 12x18 Racine.
Scrap baler Logeman hydraulic.
Shapers, 12"—16"—20"—24".
Large stock guaranteed electric motors. Any size.

Reliance Machinery Sales Company
1407 Brighton Place, N.S. Pittsburgh, Pa.

Air compressors, 139 and 450 cu. ft.
Brake, press, 6'x16 ga. Robinson.
Grinder, Bath 12x32" univ.
Grinder, 18" Diamond face, arr. m. d.
Grinder, No. 14 Besley disc, 26" disc.
Hammers, 50 lb. Mayer upright, m. d.
Hammer, 100 lb. Lingle upright helve.
Hammer, 400 lb. Bliss, board drop.
Keyseater, No. 2 Baker.
Lathe, 27"x15' Reed-Prentice, arr. m.d.
Miller, 30"x10' Newton planer type.
Presses, No. 1 Toledo, O.B.I.
Press, No. 21 Bliss, 2" stroke.
Press, horning, No. 40 Bliss.
Press, No. 82-C Toledo dbl. crank, 5" shaft, 44" wide.
Pump, Goulds 3 stage centrifugal, 250 GPM against total head of 347'.
Punch, 48" throat Whiting, 1" thru 1", arch. jaw, belt or motor drive.
Slotter, 15" Bement, crank, 36" rot. table.
What do you need? What have you for sale?

FOR SALE BY

Failor-Strafer Machinery Co.
132 Liberty St., - - New York, N. Y.

Boring mill, 72" Rogers, 2 heads.
Boring mill, 42" Bullard vert., 2 hds. 3 jaw table.
Drill, Sipp 8" overhang, b.b.
Drill, 1 Avey 3/8 cap. b. b., (2).
Grinder, Oliver 4 wheel wood tool grinder.
Grinder, 10"x36" plain cylindrical.
Grinder, No. 16 Brown & Sharpe plain grinder.
Grinder, No. 3 Brown & Sharpe cutter & reamer.
Keyseater No. 1 Davis.
Lathe, 18"x36"x9' Rahn Larmon, slide gap.
Lathe, 32"x14' Davis.
Lathe, 32"x12' Putnam, 3 step cone, d.b.g., hvy. duty.
Lathe, 32"x11' American, triple geared, hvy. duty.
Lathe, 30"x14' Davis, cone drive.
Lathe, 26"x10' Bridgeford, 3 step cone, taper attach.
Lathe, 26"x10' Walcott, 3 step cone, d. b. g., hvy. duty.
Lathe, 26"—48"x18' McCabe, two spindle.
Lathe, 24"x14' American 3 step cone, d.b.g., hvy. duty.
Lathe, 16"x5' Sidney, 3 step cone, d.b.g.
Lathe, turret, No. 2A Warner & S., bar equipment.
Lathe, turret 1" cap. Biggs hand screw mach., p. fd.
Miller, No. 2 Shields, high power, single pulley.
Miller, 48" Newton continuous, m.d.
Miller, No. 1 Van Norman, hand feeds.
Presses, 4 No. 3 Bliss Consolidated, inclinable.
Presses, No. O and OI, V & O inclinable.
Slotter, 15" New Haven, 30" table.

Russell Machine Co.
438 Oliver Bldg. Pittsburgh, Pa.

Boring mill, 42" Bullard, 2 swivel heads, s.p.d.
Boring mill, horiz. 3-3/8" bar D&H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Gear cutter, spur, 64" Newark, m.d.
Gear planers, bevel, 54" Gleason m.d., (2).
Hammer, 300 lb. Bradley, upright strap.
Hammer, 1500 lb. Bliss board drop.
Lathe, 48"x17'6" Pond, p.c.g., triple grd., b.d.
Planer, 36"x36"x14' Gray, 4 heads, b.d.
Press, hyd. wheel, 300 ton Chambersburg, m.d.
Punch, multiple, style "E" L&A 15½" th.
Punch, beam, Cleveland, cap. 24".
Shaper, 24" American high duty, b.d.
Shear, Alligator, No. 61 Carlin high knife, 2½" sq.
Shear, squaring, 10'x½", m.d.
Slotter, 18" Bem. Miles, table 36" dia., b.d.
Straightener, No. 1 Shuster flat strip metal, m. d.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

Fuchs Machinery & Supply Co.
1102-4 Farnam St., Omaha, Nebraska

Broach, No. 1 LaPoint, b.d.
Drill, 2 spdl. Henry Wright, 15" overhang, prod. table.
Drill, 3' American rad., s.p.d.
Drill, Barnes 4 spdl., 20" with individual belted m.d., each spindle, 220-3-60.
Grinder, Micro internal cylinder, m.d.
Grinder, pedestal, 7½ h.p., U.S.B.B.
Hammers, 50 & 100 lb. Little Giant.
Lathe, 20x10 American, d.b.g., q.c.
Lathe, 16x8 South Bend, l.c.
Lathe, 20x10 Monarch, geared head, m.d.
Nibbler, No. 1 Campbell 3/16, pedestal, b.d.
Press, No. 54 DAG Ferracute, d.s. cam.
Punch & shear, No. 2A Royersford dbl. end shears 8x¾. Punches 1" through ¾.
Roll, 5'4" diam., belt drive.
Saw, 6x6 Peerless, b.d.
Saw, 9x9 Peerless hack, m.d.
Shaper, 16" Rockford, cone drive.
Shear, No. 2 Ryerson serpentine, m.d.
Shear, ½" Kling rotary splitting.
Slotter, 10" Putnam, 27" table.

WANTED

TAPS-TWIST DRILLS-FILES
CUTTERS-ENDMILLS-SAWS
HACK SAW BLADES

WE WILL BUY YOUR SURPLUS TOOLS

WESTERN TOOL EXCHANGE
18 N. Halsted Street, Chicago, Illinois
SURPLUS BOUGHT AND SOLD

Want to buy Power Press Brake 10 gauge, or heavier, 3/16 or 1/4 6, 8 or 10 feet, Dreis & Krump, Clearing, Verson, Cincinnati or similar type. Wire your offering.

KERRIGAN ORNAMENTAL IRON WORKS, INC.
2nd & Oldham Sts., Nashville, Tenn.

LATHE CHUCKS
For immediate delivery

INDEPENDENT CHUCKS 4 JAW, all sizes 4¼" to 36" Diameter.

GEARED SCROLL UNIVERSAL CHUCKS.

James W. George Machinery Co.
3146 E. Jefferson Ave., Detroit, Mich.

We Buy—We Sell
USED
SPEED REDUCERS
REEVES DRIVES
Any Quantity—All Sizes, Types

Patron Transmission Co.
156 GRAND ST. NEW YORK CITY

FOR SALE — GOOD TOOLS

Drill, Automatic, Sensitive, with motor, hi. spd., cap., 3/16" .....$150.
Drill, 2 spd. Allen H. S. B. B. 14" Swing, No. 2 M. T. .....$300.
Drill, Foote Burt No. 24, 24" Heavy Duty .....$1000.
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Planer, 24"x24"x6' Gray B.D. .....$750.
Planer, 36"x36"x12' Woodward-Powel, 2 Heads, with Motor .....$2500.
Press, No. 2 Rockford O.B.I. 2" str. 22 Ton .....$325.
Press, No. 126 Max Ams O.B.I. 1" str. $325.
Tapper, No. 2 Garvin, Auto., with Motor Cap., ¼ to ¾" .....$250.
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42"x42"x12' Bedford Openside, m.d. & m.
36"x36"x8' Pond Planer, one rail, one side hd.
30"x30"x6' Pond Planer, 2 rail heads

Presses
73½ Bliss Press, motor dr. & m. (2)
74½ Bliss, tie rod cons., m.d. & m.
23A Bliss Dble. cr., gap frame, m.d. & m.
251½ Cleveland Dble. Cr., gap frame, m.d.&m.
No. 30G32 Cleveland D.C., m.d. & m.
No. 55½ Toledo Tie Rod, with dble. roll fds.
No. 52 Toledo Arch, 29x29 bolster
No. 62 Toledo (2)
No. 63 Michigan, S.S.
Nos. P2-P4 Ferracute, motor drive
Canco, No. 5, 8" stroke, S.S., B.G., m.d. & m.
DG-53 Ferr. S.S., S.C., B.G., G.M.D.
No. 6C Rockford dble. cr., straight side

No. 407 Bliss Double Crank Toggle Press, motor drive & motor
No. 410 Bliss Double Crank Toggle Press, motor drive & motor
250,000 volt General Electric X-Ray Machine, lead lined, will X-Ray boiler plate up to 2" thick, overall dimensions, length 102", width 84", height 88"

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1" National, Steel Bed
1½" Acme, steel bed, m.d.

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35 KVA Multi Hydromatic, mtr. dr. & m.
Taylor Win., Nat'l Fed'l, m.d. Butt
Taylor Winfield 4-way flash welder
Taylor-Win., Fed., Thomson Spot

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R-107	L-108	½x½x3½

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303	½x½x3½

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Tool No.	Shank Size
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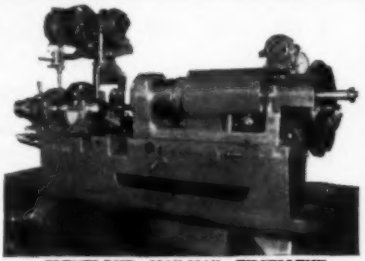

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4 spindle ⅝" Cleveland Model M, m.d.
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42"x24' Springfield

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Gisholt Universal Tool, belt
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6x32" Norton Plain Cylindrical, m.d.
No. 14—10x18" Brown & Sharpe Plain
10x24" Landis Plain Self-Contained, m.d.
10x30" Queen City Pl. Self-Contained, m.d.
10x36" Norton Plain, m.d.
10x50" Norton, Plain, m.d.
10x52" Landis Plain Self-Contained, m.d.
12x18" Cincinnati Plunge Cut, m.d.
12x36" Cincinnati Plain, belt
12x36" Modern Plain Self-Contained, m.d.
12x42" Landis Plain, belt

PARTIAL LISTING ONL

THE EASTER

1001 TENNESSEE AVENUE,

MACHINE TOOLS

12x48" Modern Plain, m.d.
12x72" Cinc. Plain, m.d., hydraulic feed
No. 1 Gardner Disc, m.d.
No. 4 Gardner Disc, belt
No. 6 Diamond Disc, belt
No. 6 Gardner Disc, m.d.
No. 20 Gardner Comb. Disc and Roll, m.d.
No. 51 Besly Disc, m.d.
No. 120 Gardner Disc, belt

PUNCHES AND SHEARS

Buffalo Armor Plate Slitting Shear, Punch & Bar Cutter, m.d. size 10 IW
Cleveland Model EF S.E., 36" throat
No. 6 Long & Allstatter S.E., 9" throat
No. 6 Long & Allstatter D.E., 24" throat
No. 2 Niagara Bench Type Hand Operated

SHEET METAL MACHINERY

No. 2 Southwark Rotary Shear, m.d., 30" throat, 8 ga.
No. 34 Lennox Rotary Bevel Shear, cap. ¾", belt
Southwark Rotary Shear, cap. ⅜", has 36" throat
Quickw. Circ. Shr., 30" throat, 16 ga., belt
McCabe Pneumatic Flanger, ½" cap.
7' Robinson Hand Brake, 18 ga.
No. 22 Williams & White Eye Bender, m.d.
6' N-B-P Hand Flanger, ¼" cap.
10' N-B-P Hand Flanger, ¼" cap.
No. 1 Campbell Nib., belt, cap. 3/16", has 6" throat
No. 2 Campb. Nib., m.d., cap. ⅜", has 12" throat
No. 10A Quickwork Double Seamer, belt
Magee Sheet Metal Wir. & Edg. Mch., m.d.

TAPPING MACHINES

No. 1 Garvin Knee Type, belt
No. 2 Garvin Automatic, belt
No. 2 Garvin Automatic, m.d.
No. 2X Garvin Automatic, m.d.
No. 2X Garvin Automatic, belt
Gaterman Oscillating Pneumatic, belt
½" Rickert & Shaffer Vertical, belt
No. 5 Webster & P. 5 spdl. Nut Tap., belt
6 spdl. 1" Acme Semi-Auto. Nut Tap., belt

WELDERS

200 ampere Lincoln, m.d.
300 ampere Hobart, gasoline engine drn.
12" Winfield Spot, 20 KVA, cap. 1/16"
Winf. Spot, 100 amperes, 47 KVA, 18" thr.
Thompson-Gibb Spot, 40 KVA, 21" throat
Federal Spot, 25 KW, 30" throat
300 ampere Lincoln, m.d.
300 ampere General Electric, m.d.

MISCELLANEOUS

No. 5 Williams & White Bulldozer, belt
Norton Run. Bal. Indicating Machine, m.d.
Sprague Elec. Dynamometer Lab. Test, 250 HP, 1500 RPM, 570 amp., 250 volt, with control equip.
No. 2 Cochran-Bly Filing Machine, belt
No. 1 Fisher Oil Groover
Production Polishing Machine, belt
No. 11 Cochran-Bly Saw Sharpener, m.d.
⅜" and ¼" Shuster Wire Straighteners

TURRET LATHES AND SCREW MACHINES

No. 3L Gisholt, m.d., chucking (2)
No. 1 Warner & Swasey, cone
No. 3 Acme Universal, chucking, m.d.
No. 0 Brown & Sharpe Hand, cone
No. 2 Pratt & Whitney, cone
No. 4 Woods Tilted Turret, cone
1" Biggs Hand Screw Machine, cone
Dresses Brass Lathe, cone
2¼x24" Jones & Lamson Geared Head, bar equip.
3x36" Jones & Lamson Geared Head, chk.
3x36" Jones & Lamson Geared Head, bar
2 spindle 3x36" Jones & Lamson Geared Head, chucking
21", 24" Gisholt Tilted Turret, cone and m.d. types
26" Libby Type Type C Turret, m.d., 7½" hole

PLANERS

24" Cincinnati Crank, m.d., 1 head
28"x28"x8' American, 2 heads, belt
28"x28"x8' Gray, 1 head, belt
30"x30"x8' Gray, 1 head, belt
30"x30"x10' American, 1 head, belt
30"x30"x10' Cincinnati, 2 heads, belt
32"x32"x8' Gray, 1 head, belt
34"x24"x8' Cincinnati, belt, 1 head
36"x36"x10' Cincinnati, 2 rail heads, 1 side head, belt
36"x36"x10' Whitcomb-Blaisdell, 2 heads, belt
36"x36"x13' Niles-Bement-Pond, 1 rail, 1 side head, belt
42"x42"x16' Rockford, variable speed m.d., 2 rail, 2 side heads
42"x42"x20' Ohio, m.d., 2 heads
60"x48"x16' Niles-Bement-Pond, m.d., 2 rail, 1 side head

MULTIPLE SPINDLE DRILLS

2 spindle Textile Horizontal, m.d. in base
3 spindle 20" Barnes Gang
4 spindle No. 2 Colburn Mfg.
4 spindle No. 2 Foote-Burt
4 spindle No. 4 Foote-Burt
5 spindle 24" Barnes All-Geared Self-Oil.
6 spindle National Acme Automatic Horiz.
6 spindle 21" Hoefer Gang
6 spindle Niles No. 4
No. 1 Pratt & Whitney 2 spindle Gun Bar.
No. 3 Baush Multiple, 16x30" rect. head
No. 5 Fox Multiple, 24" round head
No. 7D Moline 2 spindle Hole Hog
No. 14 Natco Multiple, 16x24" head
No. 18, 30 Natco Multiple, rect. head
No. 15 HC Fox, No. 26C Fox
No. 25 Baush
D31 Fox, 25" round head

END US YOUR INQUIRIES.

MACHINERY CO.,

CINCINNATI, OHIO

IN STOCK — NOW!

18" Gleason Bevel Gear Tester
18" Gleason Bevel Gear Generator
48" throat W & W Punches; ⅝" thru ⅞"
No. 5—60" Brown & Sharpe Gear Cutter
3 Sp. No. 24 Foote-Burt Drill; single pulley
Ingersoll Slab Miller; 24" between housings; single head
4" swing x 60" centers Lo-swing; two carriages
34" Gisholt Turret Lathe; 6¼" hole through spindle; two-step cone; taper attachment
No. 116 Detrick & Harvey floor-type Boring Mill; 3⅞" bar; 6x8 floor plate
No. 66 Detrick & Harvey floor-type Boring Mill; 3 7/16" bar; 10x10 floor plate; tilting table
10x24 Landis Plain Cylindrical Grinder; self-contained
16x36 Landis Plain Cylindrical Grinder; self-contained

A. R. MARSH MACHINERY CO.

4900 WEST 73rd STREET **CLEVELAND, O.**

AVAILABLE !!!

MACHINERY

2-26"x16' Gleason Lathes with chucks and taper att. Oil country
26" & 32"x18' Bridgeford h.d. with chucks and taper att. Oil country
11"x4' Seneca Falls Short-Cut, M.D.
No. 4 Bardons & Oliver, Hex Turret for Chucking & Bar work. Power feed
21"-24"-28" Gisholt Univ. Tilted Type
26"x4¼" Hole Libby Geared Head Full Universal Turret Lathe, Face Plates Pot Chucks, Boring Bars, Turret Tools. Rebuilt
6A Potter & Johnston Auto. Air Chuck & M.D. Serial 18814
2 Bath Univ. Grinders. Large size
No. 3 Diamond Surface Grinder 48" Travel. All feeds
Production Milling Machines
36"x36"x8' Detrick & Harvey Openside Planer with 2 rail heads and 1 side head. Self-contained countershaft for b.m.d.
3" Buffalo Armour Plate Bar Shear M.D. New blades
(2) N. 5½B Hi-speed Riveters M.D.
No. 3 Brown & Sharpe Gear Cutter
32" Cincinnati Gear Cutter
(2) 900 ton Zeh & Hahnemann Percussion Presses, M. Dr., 25" stroke Bed 36x50". Tie Rod, like new
(2) 9x9" Peerless shaping saws

COMPLETE PLANT

Foundry, Machine Shop and Office
74'x115' Bldg. with mezzanine, Office and Basement
R. R. Siding—large lot
6' Cupola—5 ton Crane and misc. Foundry equipment
Machine Shop has lathes, mill, planer, etc.
Pattern & Carpenter Shop
City of 35,000
Labor rates good. Taxes low
Fuel close by
Bargains for immediate disposal as complete unit

Our Engineering Service will aid in the Selection of Good Used Production Machines we have available.

A Well Managed and equipped Department for the Reconstruction of Machine Tools is at your Service.

R. A. VINE'S MACHINERY WAREHOUSE

652 WEST WILLIS AVENUE, **DETROIT, MICHIGAN**

REBUILT & GUARANTEED MACHINES

BORING MILLS:
3" Fitchburg Knee Type Horizontal
2-½" Niles Knee Type Horizontal
4-¾" Niles Knee Type Horizontal

BORING MILLS—vertical:
42" Colburn Heavy Duty, M.D.
42" NBP Standard, M.D.
44" Baush P. R. T., M. D.

ENGINE LATHES:
48"x21' Pond Heavy Duty
36"x27' Pond Two Carriages
36"x27' Gleason
20"x14' Cisco, Geared Head

GEAR CUTTERS:
36" Gould & Eberhardt, M.D.
60" Gould & Eberhardt, M.D.
72" Gould & Eberhardt, M.D., (2)
No. 12 Barber-Colman Hobbers
Nos. 3, 6, 62 Fellows Gear Shapers

MILLERS:
No. 24 Brown & Sharpe Plain
No. 2-M Potter & Johnson Vertical
Model "C" High Power Becker Vert.
Model C-2 High Power Becker Vert.
No. 6-62 Becker Improved Vertical
No. 14 Garvin Planer Type Vertical
No. 15 Garvin Planer Type Vertical
60" Garvin Duplex Miller
24" Cincinnati Duplex Miller
28" Cincinnati Semi-Automatic
18" Cincinnati Automa. Millers (2)
37"x37"x14' Ingersoll Horiz., Slab
P. & H. Vertical Key Seat

PLANERS:
30"x30"x12' Whitc., 2 hds., A.C. M.D.
30"x30"x10' Niles 3-Hds., Rev. M.D.
36"x36"x16' Niles 4-Heads, Reversing D.C. Motor Drive
42"x42"x12' Cincinnati, 2-Heads, Reversing Motor Drive (2)
42"x42"x12' Pond, 2-Heads, Reversing Motor Drive (2)
42"x42"x16' NBP 3-Hds., A.C. M.D.
60"x60"x14' Niles 4-Heads, Reversing D.C. Motor Drive
72"x72"x32' Niles 4-Heads, Reversing D.C. Motor Drive
84"x84"x20' Niles 4-Heads, Reversing D.C. Motor Drive
96"x96"x15' Niles 4-Heads, Reversing D.C. Motor Drive

MISCELLANEOUS:
20"x96" Landis Grinder
24"x96" Landis Grinder
30"x240" Landis Grinder
84" Diamond Face Grinder H. D.
48" Morton Keyway Cutter M. D.
8" Stoever Pipe Threader
No. 2 Lapointe Dbl. Spindle Broach
500 ton NBP dbl. Carwheel Press

Special: 2-9" Spindle Ingersoll Facing and Slotting Millers, M.D.

Tolerances and accuracy of our rebuilt machines unconditionally guaranteed.

NOTE:—We solicit rebuilding and motorization of your own machines.

ATLANTIC MACHINERY CORPORATION

149 Broadway, New York City Telephone: WOrth 2-0662 Cable: Atmacor

We are able to supply continuously High-Grade Machine Tools in large and smaller sizes; especially Planers, Millers, Engine Lathes, Turret Lathes and Gear Cutters, Vertical Boring Mills, as well as others.

Universal Machine Tool Manufacturing Co., Inc.

50 East 42nd Street **New York City**

VAnderbilt 6-0330

NEED GOOD TOOLS? — SEE US FIRST

D-31 Fox multiple drill, rectangular head, 16"x31½" spindle centers. No. 2 Morse taper; 10 spindles, hand and power feed to head.

AUTOMATICS, ⅞" B.

BOLT CUTTERS, 2" Landis.

DIES and MACHINES for rect. cans, inc. 61 Ams flanger; 72 Ams double seamer; 126CD Adriance double seamer; 281 Adriance gang slitter; No. 114 Adriance Automatic Double Seamer 10" round cans.

DRILLS, 36" Cincinnati, back geared sliding head, tapping attachment; 4 ft. Dreses plain radial gear box drive; No. 4 Quint six spindle turret drill; No. 4 Morse tapers; 2 sp. Leland Gifford Ball Bearing left H. sp. with tapper

ENGINE LATHES, 22"x10' Davis dble. back gear quick change; 38"x14' Fifield 14" 8' Monarch, plain change; Four 9"x20" Porter Cable Production lathes with back facing attachment.

MILLING MACHINES, No. 3½ Pratt & Whitney duplex, 60" table, 27" extreme between spindles; No. 1 Newton slab, 65" table feed.

TURRET & MONITOR LATHES, 1 3"x36" Jones & Lamson; No. 1 Am. Tool & Mach., Fox Monitor chasing bar.

PLANERS, 24"x6' Pond, one head; 36"x15' Betts two heads.

PIPE MACHINES, 3" Bignall & Keeler; 4" Saunders; both belt drive.

PRESS, No. 1 Bliss Cam Drawing Press —geared arranged for motor drive; EG. 52 Ferracute Embossing 150 ton 1½" stroke; No. 5 Marshalltown O.B.I. Press, 3" stroke arr. for Motor

CRANK SHAPER, 20" Walcott B.G.

SAND BLAST, C-36 New Haven 36"x44" Radial Sand Blast Barrel M.D.

SEPARATOR, 3 McKenzie chip production.

WIRE STRAIGHTENER, ¼" Shuster, 10 ft. Cutoff

Many other tools—exceptional "buys"—write for full details.

A. D. White Mchy. Co., 108 N. Jefferson St., Chicago, Ill.

Established 1894

AUTOMATICS

2¼" Gridley Single Spindle
3¼" Gridley Single Spindle
4¼" Gridley Single Spindle

BORING MACHINES

No. 2—3⅛" Bar Rockford
No. 1 Barrett, 3¾" Bar
No. 2 Barrett, 4½" Bar
No. 2 Barrett, 5" bar

BORING MILLS

30" Bullard
42" Niles
42" Bullard
72" Bickford.

DRILLS

1, 2, 4 Spdl. Leland-Gifford.
No. 2-4 Spdl. Leland-Gifford, Motor Spindles. Power Feed
1, 2, 4 Spdl. Henry & Wright.
No. 2 Colburn, 1 Spindle
No. 2 Colburn, 4 Spindle.
No. 4—5 spdl. Foote-Burt.
No. 1 Baush Multiple
No. 3 Baush Multiple
3½' Cincinnati-Bickford Plain
5' Western
6' Niles-Bement-Pond Universal

GEAR CUTTERS

No. 2 Barber-Colman Hobber.
No. 12 Barber-Colman Hobber.
No. ½, Pfauter Hobber.
No. 3-26" Brown & Sharpe.
No. 4-48" Brown & Sharpe.
No. 5-48" Brown & Sharpe
No. 6-72" Brown & Sharpe.
No. 6-A-72" Cincinnati.
96" Newton Spur Gear
Nos. 6, 61, 62 Fellows

GRINDERS

(See page 304—special advertisement)

Hill-Clarke Plain Cylindrical Grinders
No. 70 Heald Internal
No. 2½ Universal (Bath type).
No. 4-12"x66" Landis Universal.
8" Arter Rotary Surface
No. 5 Springfield Planer Surface

MFG. LATHES

31½"x36" Fitchburg Lo-Swing.
31½"x60" Fitchburg Lo-Swing.
31½"x108" Fitchburg Lo-Swing.
8"x60" Fitchburg Lo-Swing.

ENGINE LATHES

18"x6' Bradford
18"x8' Mueller
21"x10' LeBlond
24"x12' American.
24"x13' Chard.
24"x16' Lodge & Shipley.
24"x22' Lodge & Shipley, Taper.
26"x8', 10' Bridgeford
30"x12' Whitcomb-Blaisdell
20"-40"x10' Rahn - Larmon Geared Head Sliding Bed Gap.
40"x12' Fifield

MILLERS

No. 3 Becker-Brainard Plain.
5" Pratt & Whitney Automatic
No. 4 Garvin Profiler
No. 5 Brown & Sharpe Vertical.
No. 4-B Becker Vertical
No. 6 Becker Vertical.
24"x24"x12' Ingersoll Adj. Rail.
24"x20' Ingersoll Double Faced
36"x36"x12' Newton Duplex.
38"x44"x20' Ingersoll Slab.
72"x16"x14' Ingersoll Slab.
No. 1 Smalley-General Thread.
No. 4 Lees-Bradner Thread

PLANERS

24"x24"x6' Powell.
24"x24"x6' Rockford.
24"x24"x6' Cincinnati, 2 heads.
24"x24"x12' Gray.
30"x30"x8' American.
30"x30"x8' Powell.
36"x36"x8', 18' Cincinnati.
36"x36"x12' American 2 hds.
42"x42"x12' Liberty
42"x42"x14' Gray, 2 heads.
48"x48"x10' Niles-Bement-Pond, 2 heads.
48"x48"x12' Gray, Reversing M.D.

PRESSES

No. 01 V.&O., M.D.
No. 1 V.&O., M.D.
No. 303 Bliss S.S., Geared.
No. 58 Toledo Nosing.
No. 178 Toledo Toggle Drawing

TURRET LATHES

2¼"x26" Greenlee
3¼"x40" Greenlee
9"x36" J. & L. 2 spdl.
18" Libby
21"x8' LeBlond Universal
21" Gisholt, 3¾" H.S.
24" Gisholt, 6¼" H.S.
24" Steinle, 6¼" H.S.
26" Libby, 7½" H. S., M.D.

MISCELLANEOUS

26" Springfield Shaper
26" Mark Flather Shaper
24" Niles-Bement-Pond Slotter
No. 3-B J. N. La Pointe Broach
8" Landis Pipe Machine
12" Bignall & Keeler Pipe Mach.

HILL-CLARKE MACHINERY CO.
645 W. WASHINGTON BOULEVARD, CHICAGO

HAVING TROUBLE GETTING NEW MACHINE TOOLS ?

We specialize in building new life into your old machines.

Beds planed and re-scraped
Bearings re-fitted or re-newed
Spindles re-ground or replaced

A thoroughly dependable and accurate job

Consolidated Machinery Rebuilders

Desplaines, Illinois Tel. Desplaines 901

REBUILT MACHINE TOOLS

EXCELLENT CONDITION

GRINDERS

10"x24" LANDIS dir. motor driv. Plain Cylindrical
No. 2 VAN NORMAN, Piston Turning and Grinding Machine
No. 12 BROWN & SHARPE, Plain Cylindrical Grinding Machine
No. 2 BATH Universal Grinding Machine

MILLING MACHINES

36"x10' INGERSOLL Planer Type Slab Miller, 3 Spindle
No. 2B HENDEY Plain, motor driv.
No. 2 BROWN & SHARPE Universal
No. 3S CINCINNATI Universal
No. 2A BECKER Vertical, Motor driv.

TURRET LATHES

No. 1 WARNER & SWASEY Turret Lathe
No. 3 FOSTER Turret Lathe
No. 4 BARDON & OLIVER Turret Lathe

RADIALS

3' BICKFORD Radial Drill

LATHES

14"x6' HENDEY, Yoke Head
14" LODGE & SHIPLEY Geared Head, motor driv.
1" HARDINGE Precision Lathe
9"x4' SOUTH BEND Lathe

GEAR CUTTERS

18" GLEASON Straight Bevel Gear Generator
No. 1 ADAMS Gear Hobber
No. 00 PFAUTER Gear Hobber
No. 5A CINCINNATI Gear Cutter

SHAPERS

20" GOULD & EBERHARDT s.p.d.
20" OHIO Back Geared

PARTIAL LISTING ONLY—SEND US YOUR INQUIRIES

NORTH MACHINE TOOL CORP.

1790 BROADWAY **Telephone Circle-5-5191** **NEW YORK CITY**
WAREHOUSE 29-26 40th ROAD **LONG ISLAND CITY, N. Y.**

HIGH GRADE TOOLS

LATHES

15″x8′ Cisco, Cone Drive, Quick Chg.
18″x8′ Greaves Klusman Geared Head, Quick Change.
18″x8′ Monarch Grd. Hd., A.C., M.D., Q.C.
20″x10′ Hendey Cone Q.C.
20″x10′ Bradford, Cone Drive, Quick Change.
24″x10′ Bradford, Cone Drive, Quick Change.
24″x12′ American Grd. Hd., A.C., M. D., Q.C.
21″x10′ LeBlond, 3 S.C.D. D. B. G.
26″x48″x22′ McCabe Double Spindle Lathe.
30″x14′ Lodge & Shipley, Cone dr., quick change.
30″x16′ Lodge & Shipley Cone Q.C.
36″x12′ Lodge & Shipley, Cone dr., Trip. Grd. Q.C.
36″x16′ Boye & Emmes Trip. Grd., Q.C.
20″x8′ Lodge & Shipley Pat. Hd. Q.C.
14″x6′ Vernon, Cone drive, Q.C.
24″x10′ American, 3 S.C.D. D.B.G. Q.C.
50″x20′ Pittsburgh, Trip. Grd. Cone

PLANERS AND SHAPERS

16, 20, 24″ G & E Shapers, cone dr.
16, 20, 24 and 28″ Gould & E. Shapers, S.P.D.
20″ Cincinnati Shaper, Cone drive.
21″ Smith & Mills Shaper, Cone dr.
30″x30″x10′ Cincinnati Planer, B.D.
60″x60″x12′ Pond H.D., 3 Hds.

RADIAL & UPRIGHT DRILLS

2½′ Cincinnati Bickford Upright Radial Drill.
4′ Dreses Universal, S.P.D.
21″, 24″ Cinc. B. Upright Geared Fds.
24″ Barnes Upright Drill.

GEAR CUTTERS

No. 1, 2, 3 Adams Farwell Gear Hobs.

GRINDERS

Gardner 7½ H.P. Disc Grinder, Mechanical tables.
6″x18″ Ott Plain Grinder.
6″x18″ Landis Plain, Self Contained.
53″ Besly Ball Bearing Vert. Spindle Disc.
No. 55 Heald Internal Grinder.

MILLERS

No. 4 Cinc. Hi. P. Cone 3 S.C.D. D.B.G.
No. 4 Cinc. H.P. Cone Univ. 3 S.C.D. D.B.G.

BORING MILLS

No. 2 Niles Boring Mill, A.C. M.D.
51″ Niles, 2 Hds., M.D.
84″ Pond Vertical Boring Mill.

TURRET LATHES

4 Spdle. New Britain Chuck. Mach.
Pierce 1″ capacity Bar feed & mtrzd.
5A Potter & Johnson

MISCELLANEOUS

1½″ Hayden 4 spindle Automatic Screw Machine.
2½″ Landis Bolt Cutter.
No. 4 & 5 Mitts & Merrill Keyseats.
Model W Cleveland Pch. & Shr. 60″ thrt., M.D.
6′x3/16″ Chicago Bending Brake.
No. 92D Toledo D.C. Press.
No. 4A High Speed Riveter New.
2—No. 35 Niagara Presses New.
No. 36 Niagara Press New.
3-¾″ Hayden Five Spindle Automatic Screw Machines.
Quickwork Rotary Shear, M.D.
13″x13″ Peerless Saw.
8″ Atkins Saw.
6″x6″ Peerless Shaping Saw.
35 K. W. Federal Spot Welder.
3″ Landis Bolt Cutter, Cone drive.

CINCINNATI MACHINERY & SUPPLY CO.

217 EAST SECOND STREET **CINCINNATI, OHIO**

Guaranteed

NO. 2B HENRI HAUSER JIG BORER, MTR. DRIVE. FULLY EQUIPPED.
16"x6' and 16"x8' SEBASTIAN 8-SPEED GEARED HEAD TIMKEN BEARING LATHES, MOTOR IN BASE, NEW.

DRILLS

No. 22 Natco Multiple 24 Spindle Rect. Head, 13½"x31" area.
No. 13 Natco, 16 Spindles.
24" Hoeffer Sldg. Hd. Tap. Att.
20" Barnes all-grd.
16" Superior, H. S., B. B.
1 & 2 Sp. Demco, H.S. B. B.
No. ½ Avey Bench Drill.
2 Spdle. Avey H.S. B. B.
1 & 3 Sp. Allen, P. F. & T. A.
No. 1&2 Leland-G. b., tap Att.
4' Western Mfg. Type, Plain Radial, M. D.

GRINDERS

No. 3 Cincinnati Universal.
No. 1 B&S Univ. Belt Drive.

LATHES

24"x12' Schum. Boye q. c. g.
24"x10' L. & S. Q. C. G, B. G.
16"x8' Greaves Klusman Grd. Hd., Q. C. G.
16"x12' Hendey Q. C. G., T. A.
14"x10" Hendey Q. C. G., T. A.
9"x4' Seneca Falls, Standard Change Gear, Back Geared.
8"x18" Porter Cable, collets.

LATHES, TURRET

No. 1 Foster Hand.
No. 3 Smurr & Kamen Hand.

MILLING MACHINES

28" Cinc. Semi-Auto. Dupl. B.D.
40" Gisholt Vert. Bor., arr. MD.
No. 2 P & W Hand.
No. 3 Becker Vertical.
No. 1½ Garvin Universal.
No. 1 Kempsmith Univ., B. G.
6"x48" Pratt & Whitney Thread.
No. 33 Kempsmith Plain, M. D.
13x67" Table.
No. 4 Becker Vertical, Back Gr.
No. 2V Reed Prentice Vert. MD.

PRESSES

Model "B" Rockford 1" Stroke, Floor Legs.
No. 1 Bliss Cam, Fly.

SHAPERS

25" S&M B. G. Crank, M.D. gr. b.
24" Stock. b. g. crank, M. D.
24" Steptoe B. G. Crank, SPD thru Gear Box.
20" Steptoe b. g. crank.

MISCELLANEOUS

Bolt Cut., 1" Landis Lead Scr.
Die Filer, No. 5 Thiel, m. d.
Gear Cut., No. 3—26"—B. & S.
Riv Hmrs., 1½B, 2A, H. D., 3A, 3A H. D., & 5A Hi. Spd.
Riv. Spin. ⅜" Linley, M. D.
Saw, 6x6 Peerless Hack.
Saw, No. 1 Marvel Hack.
Welder, 25 K. W. Acme.

George M. Bernstein & Co.

12 SO. CLINTON STREET — CHICAGO, ILLINOIS

MOSER'S HIGH GRADE TOOLS

No. 3-A W.&S. Turret Lathe, MD., chk. wk.
No. 33 Kempsmith Milling Machine
42"x10' Ingersoll Fixed Rail Head Miller
3" Oliver Drill Grinder, arranged M.D.
Oliver Arc Face Mill Grinder, 24" cap.
No. 65 Heald Int. Grinder, arr. M.D.
12"x6' American Q.C.G. Lathe, D.B.G., collets, chucks, taper attachment
14"x8' Davis Q.C.G. Lathe, ctrshaft M.D.
20"x12' Hendey Q.C.G. Lathe, taper att., pan bed, M.D.
24"x12' Walcott Q.C.G., D.B.G. Lathe
2—No. 2 Avey Single Spindle Drills
No. 2 Leland-Gif. Sgl. Spindle Drill
No. 3 Avey 4-Spindle Drill, B.D.
No. 2-A High Speed Rivet. Hammer, M.D.
No. 130 Pexto Foot Op. Squar. Shear
No. 24 New Britain 5-Station Auto., B.D.
No. 30 Natco 32-Spindle Drill, B.D.
Dbl. End Rockf. Horiz. Bor. & Drill. Mch.
Dbl. End W. F. & John Barnes Drilling Mch.

MOSER MACHINE TOOL SALES — 1608 W. Clybourn St., Milwaukee, Wis.

TURRET LATHES

2—No. 1 Warner & Swasey, ⅝"
2¼"x24" Jones & Lamson
No. 7 Bardons & Oliver G. H.; 4¼" H.S.
6"x6-¾" Goss & De Leeuw 4 spindle chucker

THREAD MILLER

No. 3 Lees Bradner, G. H. 3-1/3" col. cap.

MILLING MACHINES

No. 1 Brown & Sharpe Plain, cone, P.F.
No. 3 Owens Universal, cone, equipped

SHAPERS

16" Gould & Eberhardt, motor driven thru gear box
7" N-B-P Vertical Slotter

LATHES

14"x6' Hendey, yoke head, motorized T. A., complete
18"x8' Barnes Semi Q.C.G.
22"x8' Whitcomb Blaisdell Semi Q.C.G.

DIE SAWING MACHINE

20" Grob open end Band Saw, M.D.

BARRON MACHINERY COMPANY

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Good Used Tools Immediately Available

AUTOMATICS

18" Gisholt Simplimatics
1" Cleveland Model J double end threading, pointing, turning or drilling
1½" Cleve. Model M, 4-spdl.
1⅝" New Britain, 6 spdl.
1⅝" No. 55 Natl. Acme 4-spdl.
2" Nat. Acme 4-spdl., Mod. B
2¼", No. 56 Natl. Acme 4-spdl.
No. 24, 33, 34 New Brit. chkg.
No. 5A & 6A Potter & Johnston

DRILLS

No. 2 and 4 Colburn
20" No. 216 and 217 Baker heavy duty
22" No. 121 Baker light heavy duty
24" No. 314, 315 and 321 Baker heavy duty
36" No. 416 Baker heavy duty
20" W. F. & J. Barnes No. 320 heavy duty
20", 22" & 24" Barnes AGSO
No. 11, 12, B12, C12, 22, 14, B14 and 30 Natco multiple drills
3' Cincinnati radial
5' Western radial
5' American, 13" column rad.
No. 3 Barnes horizontal rad.
Cone or SPD, no tapping

GRINDERS

No. 2 Heim centerless
17"x36"-48" Norton dbl. hd. hydraulic crankpin, type B, Mod. 84
6"x32", 10"x36", 10"x50" Norton cyl.
10"x24" Landis cylindrical
No. 50 & 75 Heald internal
No. 1 & 2½ Bath tool & cut.
10"x36" Thompson universal
Norton type 15 vertical lapping, for cylindrical and flat work
Pratt & Whitney worm or thrd.
Pratt & Whitney screw feed, or leader, worm or thread
No. 20 Bath spline shaft grdr.

ENGINE LATHES

14"x6' Walcott
14"x8' Lodge & Shipley
16"x6' Lodge & Shipley
16"x6' Cincinnati
20"x10' Davis
20"x10' American
24"x10' Schumacher & Boye
24"x10' LeBlond
24"x12' Lodge & Shipley
24"x16' Schumacher & Boye
36"x22' Schumacher & Boye

TURRET LATHES

1½" Foster
No. 4, 6 and 9 Foster
No. 4 Bardons & Oliver
No. 4 Cincinnati
No. 2SP Garvin
No. 6 Warner & Swasey
No. 2 Warner & Swasey
2¼"x3" Jones & Lamson
21⅛ Gisholt
24' Gisholt
24" Bullard, Rapid Production

BORING MILLS

3" Rockford horizontal
4" Landis floor
36" Niles car wheel
52" Gisholt
60" Colburn

MILLERS

No. 1 Kempsmith plain
No. 2A Brown & Sharpe Univ.
No. 3 Brown & Sharpe plain
No. 4 Cincinnati universal
No. 1½ Knight vertical
No. 3 and Model AB Becker vertical
28" single head Bullard vert.
42" dbl. hd. NBP vertical
No. 3 & 3E Lees Bradner thrd.
No. 1 Davis Thompson cont. Rowbottom cam miller
Type 45 Bilton productomatic

PLANERS

24"x24"x24" Cincinnati crank type, one rail head
24"x24"x8' Rockford, 1 rl. hd.
30"x30"x10' Cincinnati, one (or two) rail heads
32"x32"x12' Niles, 1 rail and 1 side head
54"x42"x12' Gray
56"x56"x16' Gray, 2 rail and 2 side heads

PRESSES

750 ton Baldwin Southwark triple act. hyd. tog. draw.
150 ton No. 661 Toledo coining, 3" str.
150 ton Elmes hydraulic
100 ton French Oil Machy. Co. hyd. for straightening cast.
108' No. 796¼D Toledo double crank toggle drawing
No. 30E Cleveland SS
28" No. 71 Swaine dbl crank
No. 21½ Bliss Consol. OBI
Waterbury Farrel OBI, 4½" shaft
No. 76 grd. Toledo gap
Fremont gap, 75 tons
Waterbury Farrel gap, 40 tons
No. P2 Ferracute
Nos. 55, 55½ and 56 Tol. str.
No. 65 Consol. SS
No. 7 Rockford SS
No. 8-7 Zeh & Hn. SS
No. 74½ Bliss, SS
No. 4 Massillon, SS, grd.
No. 180 Toledo
No. 80 Toledo horn
No. 25½ Bliss Consol. horn
No. CA14 Ferracute, horn
Nos. 13 and 14 Toledo, horn
3, 8 and 20 ton Gen. Flexible
3 ton Fox No. 6

MISCELLANEOUS

No. 5, 23 & 29 Williams & White bulldozers
Barnes single spindle horiz. diamond boring machine
Coulter double spindle diamond tool bor. mch. A121
44" 2-arm Norton balancing machine
4"x12" Sundstrand double end centering machine
4"x36" Sundstrand double end centering machine
150 HP General Electric dynamometer type TLC-50
10 HP GE dynamometer
3000 amp. 15 V. Jantz & Leist plating generator
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No. 3 and 4 Mitts & Merrill keyseaters
Blakeslee metal washer or degreaser

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1—D-25 16 Sp. Fox Mult.
1—4 Sp. Colburn Mfg. 1½" Cap.
GEAR CUT., 1—11" Gleas. Bev. Gr. Gen.
1—No. 3—36" Brown & Sharpe
1—36" Fellows Gr. Shaper
1—No. 5—60" Brown & Sharpe
GRINDERS, 1—No. 6, 20 Bryant Internals
1—10"x36" Thompson Universal
1—No. 4 Brown & Sharpe Universal
1—No. 1 Webster & Perks, Universal
LATHES, 1—16"x8' L & S
1—16"x8' Prentice
1—16"x10' Springfield
1—20"x8' L & S
1—26"x10' Prentice
1—36x12' L & S
1—36"x20' Le Blond, Gr. Box M. D.
2—24" Gisholts, 6¼" Hole
1—3"x36" Jones & Lamson
1—3"x60" Fitchburg Lo Swing
MILLERS, 2—No. 2 Cinn. C.D. Grd. Fds.
1—No. 1½ American, Vert. Hd.
1—No. 25 Becker
1—No. 1 Standard Engr. Hand
PLANERS, 1—36"x36"x10' Gray
PRESSES, 1—No. 24 Adriance Horning
1—No. 40 Bliss Horning, Grd. M.D.
1—No. 54 Toledo, 45 Tons, Side Shear
2—No. 55 Bliss Cons.
1—No. 56 Toledo 130 Ton
1—No. 12 Waterbury, 150 Tons Side Shr.
SHAPERS, 1—14" Rockford
1—16" G & E
1—20" G & E., S. P. D., thru Gr. Box

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BORING MILLS
3" Bar, Floor type-cross tbl.
4" Bar, Niles, Table type
5" Bar, Beaman-Smith, Hor.
52" Rodgers Vertical 1 head
DRILL
32" Cincinnati Sl. Head. Tap. Att.
HOBBERS & GENER'S.
6" & 11" Gleason bevel gear
26" Rhenania
LATHES
3½x60 Fitchb.; Lo-Sw. S.P.D.
18x8 LeBlond L.C.G.
24x8 Sch-Boye, Q.C.G. T.A.
24x12 Sch. Boye Q.C.G. Tap. Att.
27x16' Bridgeford—cone
34x12 Pond L.C.G.
MILLING MACHINES
No. 2 K. & T. Plain. Cone
PLANER
36x36-8 Cincinnati—2 hds.
SHAPERS
24" Walcott, Helical Gear
24" Ohio, B.G. Single P.D.
SCREW MACHINES
1" cap. Woods Titlted Tur.
2A W. & S., Cone Dr.
MISCELLANEOUS
Metal Saw: No. 8 Marvel
Broaches: V18 Amer.
1 & 2 Spindle LaPointe
Drills: 20" to 25" Barnes, B.G. Tap. Att.; 14 sp. Pratt & Whitney Multiple
No. 6 Wells wire st. & cut.
Grinders: 18" to 30" Disc. 8", Heald, Rotary Surface

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Good Lathes — Good Values

40" 20' Houston Stanwood & Gamble Triple Gear, Q.C.G. Taper & Equip.
28"x20' Schumacher-Boye, D.B.G., Q.C.G., Taper and Equipment
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27"x16' Draper, Geared Face, Plate Drive, Equip
18"x10' Reed-Prentice, Geared Head, Q.C.G., Taper and Equip.
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Also Millers, Shapers, Planers, Radials, Etc. in Stock for Immediate Delivery

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BRIDGEFORD CENTER DRIVE AXLE LATHE

(Will take up to 12" x 8' Axles)

1500 lb. CHAMBERSBURG SINGLE FRAME STEAM HAMMER
GLEASON LATHE—48" Swing, 13' bed, BD.
BARRETT HORIZONTAL BORING MILL—5" bar, BD.

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AUTOMATICS:
4¼" Cleveland Model "A"
12x6 J&L Hartness Chucker

BRAKES:
6'x3/16" Ohl Press Brake, large variety Dies; M.D.
3' Hand Box & Pan Brake, 14 ga. D&K
3' Hand Bending, 14 ga. D&K.

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40" Bausch Motor Driven
24" Bullard Vert. "New Era"

THREAD MILLER:
6x14 Pratt & Whitney
Smalley General 6" hole in spindle, Belt Drive

SHEARS:
No. 196 L & N 8'x16 ga., Foot Power with holddown; back screw gauges; front gauges
No. 296 Stoll, 8'x14 ga., with holddown, and gauges
Bliss 8'x3/16, geared, overdriven, gap Shear; 15" gap; weight 17,800 lbs.
No. 236 Niagara Geared, Under Driven, motor drive, 36x14 gauge
No. 236 Stoll Geared, Under driven direct acting, 36"x16 gauge
No. 136 Niagara direct acting, 36"x16 gauge
No. 142 Queen City Shear; 42"x 14 ga.
Wais & Roos 10'x¼ cap. Motor Drive; 40,000 lbs.
No. 748 Niagara Grd. M.D. (3)
48"x3/16" capacity
No. 236 Niagara, Grd. Underdriven; M.D. 36"x14 ga.
10'x¼ Waiss & Roos M.D. 24" gap

IRONWORKERS:
No. 0 Buffalo Bar Shear, 2x2x ¼" angles
No. 1 Pels Hand Univ. Ironwkr.

DRILLS—
HEAVY DUTY UPRIGHT:
Foote Burt No. 21; extra height; like new
Snyder 36"; No. 5 Tap ;28"-24"
Snyder 36" and 28"; also 24"
Barnes 24"; 21", sliding head
Barnes 24" Slid. Hd. 21" 20"
Cinc.-Bick. 28" Tapping Attch.
Cincinnati 24"; 21"
Aurora 24" with tapping spindle

DRILLS—Sensitive High Speed:
No. 3 Avey Sgl. & Mult. Spdl.
Avey No. 3, one, two and three spindles
Avey No. 2, one, two, three & six spindles
Avey No. 2 Sgl. & Mult. Spdl.
Lel. Gifford Single, 2 & 4 spindles
Leland-Gifford No. 2, one, two and four spindles
Henry & Wright No. 2, one and two spindle, class "K"
Henry & Wright Single, and two spindle No. 2
Foedick No. 2 Super Speed with Tapping Att.
Meline No. 5 Hole Hog, 6 spdl. Rail
Harrington No. 2, 12 spindle Multiple, Like New
Fox Multiple Spindle. No. 2 M.T.; 8 spindles
Natco No. 11; 12 spdls., No. 1 M.T.
100 spindles additional Drills all sizes

RADIAL DRILLS:
4' Bickford 11" column
4' NBP 11" column; Semi-Univ.
3½' Silver 9" column
3' American 9" column
3' Mueller 9" column
3' Dreses 9" column
3' Dreses (Simplex)
3' Carlton Sensitive, M.D.
4' Dreses Flat Column

LATHES:
4"x104" LoSwing Fitchburg (2)
4"x60" LoSwing Fitchburg (3)
3"x48" LoSwing Fitchburg (2)
9"x32" So. Bend Bench Lathe
8"x36" American, Bench Lathe
12"x5' Willard Geared Head
13"x6' P & W Cage - Makers
14"x6' Stand. Lathe Wks., cone
14"x6' Rockford, Q.C.G.,cone dr.
14"x8' Hendey, Geared Head
14"x6' LeBlond, Q.C.G., cone dr.
14"x6' L&S, q. c. g., cone
16"x6' L&S, 12 spd., grd. head
16"x6' Monarch Q.C.G. cone dr.
16"x6' P & W, plain chg.; c.d.
16"x6' Reed Plain Change; c.d.
16"x6' Cinc. Q.C.G. c.dr., Taper
16"x8' Cincinnati, QCG, cone dr.
16"x10' Reed-Pren., Q.C.G., c.d.
17x8' Sidney, Hy. Duty,Q.C.G.,c.
18x8' Chard, semi-q. c. g., cone
18x8 Mueller, Q.C.G. cone drive
18"x8' Mueller Pl. Turning, Heavy Duty
18"x8' Cisco, Q.C.G. cone drive
18x8' Hamilton, QCG, cone dr.; taper
18x12' Prentice, Pl. Ch., Taper
18x12' Hamilton, Pl. Change Chuck cone
19"x8' LeBlond Hvy. Duty Prod.
20x10' Davis, Pl. Change; c. d.
21x8' LeBlond Heavy Duty with Turret
24x12' Crawf.-Erie, QCG,cone(2)
26"x9' Bridgeford Q.C.G. cone d.
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ROLLS:
84"x8" Pinch Type
84"x4" Rolls; slip type
48"x3¼" Rolls; slip type
36"x3" Rolls; slip type

PIPE MACHINES:
2" Chicago
2" Jarecki
2½" Landis
4" Curtis
6" Jarecki
6" Williams
12" Saunders

BROACHING MACHINES:
No. 4 La Pointe of Hudson
No. 3 LaPointe of Hudson

PAPER CUTTERS:
42" Acme, Power Clamp
24", 30", 54" Jacques Hand

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Adams No. 1 Hobber; 12" (2)
Whiton Spur Gr. Cutter No. 2
Whiton Automatic Univ. Cutter No. 2
Schuchart & Schutte 18" Hobber
Barber-Colman No. 12; M.D.,(3)
Barber-Col. No. 3 standard; b.d.
G&E 48" Cutter, fine condition

RIVETERS & HAMMERS:
No. 3R Marquette Riveting Press; back geared; M.D.Air Cushions
No. 80 Grant Rivet Spinner
No. 0 Grant Bench Type Rivet Spinner
No. 1A Rochester High Speed
No. 1B Rochester High Speed
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No. 1 Campbell Nibber 3/16" 6" throat
15 lb. Bradley Upright
50 lb. Little Giant Upright
400 lb. Peck Drop Hammer with Auto Lifter
200 lb. Bliss Board Drop, poppet base (new)

AIR COMPRESSORS:
6x6 Bury, horizontal
6x6 Curtis Vert., twin
7½x6 Ing. Rand, type REI
9x8 Blaisdell-Bradford
10x10 Chicago, Pneumatic
12x10 Ingersoll Rand
10x8x7½ American "Fairhurst" High Pressure
14x14x8 American "Fairhurst" 500 CFM

ENGRAVER:
No. 3 Zeiss, Flat & Tubular Work; belt drive

SAWS:
Cochrane-Bly No. 1B, 2B, 4B Cold Saws
Laidlaw Metal Cutting Band Saw, M. D.
Peerless 6x6 belt dr.; cab base
Racine 6x6 (3)
Toledo 6x6 M. D. new High Speed Hack Saw
Peerless 9x9

PRESSES:
Wallace direct connected M. D. 18" Band Saw
No. 11 C&B Saw Grinders (3)
30", 36" American & Sidney Band Saws
No. 4 American Band Resaw
No. 5 American, S.S. Geared
No. 37½ Bliss, S.S. Geared
No. 37½ Bliss Plain Flywheel
No. 14 Toledo Horn
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No. 21A Bliss OBI, Grd. (3)
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No. 20B Bliss OBI, Plain
No. 20 Bliss OBI, Plain (10)
No. 19 Bliss OBI, Plain (2)
No. 18 Bliss OBI, Plain (2)
No. 2½ V&O Plain Press, OBI
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No. 46 Perkins Grd., Back flywh.
No. 16 Bliss Horn, M. D.
No. 14 Stoll, OBI
No. 3R Marquette, Grd. M. D.
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6-ton General Flexible
12-ton General Flexible
No. 5 Greenerd Broaching
No. 4 Adriance, OBI, Plain
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No. 75 Toledo, Open Back; Plain flywheel
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Partial Listing Only. Send Us Your Inquiries.

FALK MACHINERY COMPANY 18 WARD STREET ROCHESTER, N.Y.

Foster No. 1B Universal Geared Head Turret Lathe, M.D.
Niagara No. 10E—10 Ft. 3/16 capacity Squaring Shear, M.D.
American 27"x16' Geared Hd. Lathe

Drills: American 3' Triple Purpose Radial, M.D.
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Leland-Gifford 4 Spindle B.B.
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Springfield 16x6' Tool Room
Lodge & Shipley 16x8' Cone Head
Monarch 16x8' Geared Head, M.D.
American 20x12' Cone Head
Lehman 20x14' Cone Head
Boye & Emmes 24x16' Cone Head
Turret Lathes: Steinle 24" Geared Head
Milholland 18" Cone Head
Milling Machines: Brown & Sharpe No. 2 Universal
Brown & Sharpe No. 2 B Plain Grd. Hd.
Kempsmith No. 2 Plain
Planers: 38"x42"x10' Gray
36"x36"x10' Whitcomb
Brake: D. & K. 6 ft. 3/16 cap., Pwr Apron Type
Tapper: Haskins 2 H. P., M.D.

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Boring Mill, Niles 60" Vert., 2 hds.
W. & S. No. 2-A ser. over 200,000
Lathe, L. & S. 30"x16', qk. chg.
Lathe, Hendy 14x6 geared head
Automatic, Fay 14" (2)
Fellows No. 7 hi.-speed Gear Shaper
Fellows No. 65 Gear Shaper, M.D.
Gleason 4" bevel Gr. Generat., M.D.
Planer, Cleveland, opens., 30x30x12
Radial Drill, Western 5', S.P.D.
Tinius-Olsen Static-Dynamic Testing & Balancing Machine
Miller, Ingersoll 36 x 36 x 10', Horiz. sp, M.D.
K & T 2-½-B vert. Miller, S.P.D.
K & T No. 2 continuous rotary Miller, motor-in-base
Miller, K & T. No. 2 Universal, dbl. over-arm
Miller, K. & T.No. 1-B Univ.
Press, Robinson No. 40-B, dbl. crank

Over 500 Machines in Stock
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"MACHINES HARD TO FIND"

1—30"x36"x20' Whitcomb Planer, 2 hds. on cross rail, m.d.
1—72"x72"x20' Pond Spur Gear Planer, 2 hds. on cross rail.
1—54" Rebuilt Colburn Vert. Boring Mill, 2 swiv. hds., m.d.
1—No. 3 Barrett 6" bar Cylinder Boring Machine, m.d.
1—No. 72A-3 Rebuilt Heald Sizematic Internal Grinder, m.d.
1—36"x20' Rebuilt Boye & Emmes 3-step cone, dbl. b.g. Lathe, 13'6" between centers, with full swing rest.
1—No. 60 NATCO 3-way Mult. Spdl. Drilling Machine, m.d.
1—Rockford Horiz. Dbl. Spdl. Hydraulic Boring Machine, m.d.

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SPECIALIZING IN
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High Speed Drills
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SPECIALIZING IN
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Complete Stock of Drill Rods

HEIM DOWEL PINS

HARDENED TEMPERED AND GROUND

Immediate Delivery from Stock

Heim Dowel Pins are manufactured from an alloy steel carefully heat treated and ground to a tolerance of .0002"

All sizes are stocked in two groups

Group A ground .0002" over nominal diameter for regular use.

Group B ground .001" over nominal diameter for repair work and where holes have become enlarged.

Packed in substantial containers. One dozen per box, properly labeled, or can be furnished in bulk.

All prices are net as listed. Effective May 5, 1941.

25c PER DOZEN IN ANY QUANTITY

Nominal Size Diam.	Lgth.	Part Numbers Grp. A	Grp. B
1/8"	1/2	A-24	B-24
	5/8	A-26	B-26
	1	A-28	B-28
	1 1/4	A-30	B-30
	1 1/2	A-32	B-32
3/16"	1/2	A-34	B-34
	5/8	A-36	B-36
	1	A-38	B-38
	1 1/4	A-310	B-310
1/4"	1/2	A-44	B-44
	5/8	A-46	B-46
	1	A-48	B-48
5/16"	1/2	A-54	B-54

35c PER DOZEN IN ANY QUANTITY

3/16"	1 1/4	A-312	B-312
	1 1/2	A-314	B-314
	2	A-316	B-316
1/4"	1 1/4	A-410	B-410
	1 1/2	A-412	B-412
	1 3/4	A-414	B-414
	2	A-416	B-416
5/16"	3/4	A-56	B-56
	1	A-58	B-58
	1 1/4	A-510	B-510
	1 1/2	A-512	B-512
3/8"	1/2	A-64	B-64
	5/8	A-66	B-66
	1	A-68	B-68
	1 1/4	A-610	B-610
1/2"	1/2	A-804	B-804
7/16"	1/2	A-704	B-704
	1	A-706	B-706
		A-708	B-708

45c PER DOZEN IN ANY QUANTITY

1/4"	2 1/2	A-418	B-418
	2 1/2	A-420	B-420
5/16"	1 1/2	A-514	B-514
	2	A-516	B-516
3/8"	1 1/2	A-612	B-612
	1 3/4	A-614	B-614
	2	A-616	B-616
7/16"	1 1/2	A-710	B-710
	1 3/4	A-712	B-712
	1 1/2	A-714	B-714
1/2"	1/2	A-806	B-806
	1	A-808	B-808
	1 1/4	A-810	B-810
	1 1/2	A-812	B-812
	1 1/4	A-814	B-814

55c PER DOZEN IN ANY QUANTITY

5/16"	2 1/2	A-518	B-518
	2 1/2	A-520	B-520
3/8"	2 1/2	A-618	B-618
	2 1/2	A-620	B-620
7/16"	2	A-716	B-716
	2 1/2	A-718	B-718
1/2"	2	A-816	B-816
5/8"	1 1/2	A-1010	B-1010
	1 1/2	A-1012	B-1012

All prices subject to change without notice.

All prices F.O.B. your plant on orders of $5.00 and over

65c PER DOZEN IN ANY QUANTITY

3/8"	2 1/2	A-622	B-622
	3	A-624	B-624
7/16"	2 1/2	A-720	B-720
1/2"	2 1/2	A-818	B-818
	2 1/2	A-820	B-820
	2 1/2	A-822	B-822
5/8"	2	A-1016	B-1016

90c PER DOZEN IN ANY QUANTITY

1/2"	3	A-824	B-824
5/8"	2 1/2	A-1020	B-1020
	3	A-1024	B-1024
3/4"	2	A-1216	B-1216

$1.20 PER DOZEN IN ANY QUANTITY

5/8"	3 1/2	A-1028	B-1028
3/4"	2 1/2	A-1220	B-1220

$1.60 PER DOZEN IN ANY QUANTITY

3/4"	3	A-1224	B-1224
	3 1/2	A-1228	B-1228
7/8"	2 1/2	A-1420	B-1420
	3	A-1424	B-1424

$2.10 PER DOZEN IN ANY QUANTITY

7/8"	3 1/2	A-1428	B-1428
	4	A-1432	B-1432

YOUR REQUIREMENTS ARE OUR BUSINESS

This partial stock list illustrates the wide variety of used machine tools we handle.

SCREW MACHINES

1—No. 0 Brown & Sharpe Full Automatic
2—No. 00 Brown & Sharpe Turret Formers
2—No. 00 Brown & Sharpe Turret Formers
1—No. 0 Brown & Sharpe Cut Off
1—No. 2 Brown Sharpe Turret Former
No. 53 Acme 4 Spdl., No. 55 Acme 4 Spdl.
No. 33 New Britain Automatic Chuck. Mch.
No. 2 Pratt & Whitney Hand Screw, Arrd. M.D.

PLANERS

Lynd-Farquhar 28" Comb. Plr. & Shpr. OS
42"x42"x10' D & H Openside 2 rail heads, 1 side head

DRILLS

Avey Single Spdl. No. 2 M.T.
L & G 2 Spdl. Hdy. Cycle
Avey 4 Spdl.
L & G 4 Spdl.
L & G 6 Spdl.
Davenport 10 Opposed Spdl.
5 Spdl. Detroit Driller

LATHES

16"x8' Reed Prentice, Geared Head, mtr.
14"x6' Reed Prentice Lathe, Grd. Hd.
14"x8' Seneca Falls, M.D.
18"x14' American, M.D.
3¼"x60" Lo Swing
3¼"x36" No. 3 Cinc. Acme Turret Lathe

UNUSUALLY FINE GRINDERS

No. 3 Cincinnati Universal
6" x 19" x 36" Norton Openside Surface Grinder, M.D. With motor, Mag. Chuck, Pump and water filter
2—10"x18" Norton Ext. Grdrs. Arrd. M.D.
8" Heald Rotary Surface Grinder
6"x32" Norton Plain Cylindrical Grinder
3—12" Pratt & Whitney Surface, mg. chk.
Hanchett Traveling Wheel Grinder, Type UK, Class 500, 150" cap. Motor drive with motor

MISCELLANEOUS

13½"x54" Mag. Chuck
Lipe 2 Spdl. Gear Chamferer
Pettingell Bumping Hammer
36" Quickwork Sht. Mtl. Bumping Hammer
Hutto 2 Spdl. Honing Machine
No. 1U Bethel Player Lapper
W. F. Fraser Lapper, 20"
No. 13 Pratt & Whitney Sgl. Spdl. Profiler
20 Ton Hanna Yoke Type Riveter
Dings Mag. Chip Separator
No. 1 Garvin Tapper
⅜" Hubbell Horiz. Tapper
Webster & Perks 5 Spdl. Tapper
Kent ½" Stud Threader
No. 3 DSSD Manville Header

MILLS

No. 40 Bilton Productomatic
No. 50 Bilton Productomatic
No. 8 Bilton Productomatic
No. 15G Bilton Gear Millers

SHEARS

Oeking Comb. Punch & Shear
No. 748 Niagara (2)
2—Pettingell Sht. Mtl. Rotary
Buffalo Armor Plate Bar Cutter

PRESSES

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BORING MILLS—Baush 44" m.d. Bullard 51" Vert., 2 hds., Bullard 42" Mill, vert.; Rockf. No. 2 horiz., 3⅛" Bar; Colburn 42" Vert. 2 Hds.; Colburn 42" one head; Mach. Tool 3" Horiz.

BRAKES—D. & K., 5' Box & Pan, 14 ga. Keene 10' 16 ga. Toggle Press.

CUT-OFF MACHINE—Davis 6" cap.

DRILLS (RADIAL)—Fosdick4', Carlton 4' all gear box dr.; Hammond 4' sensitive; Mueller 4½' g. box; Morris 3' Gr. Box

DRILLS (H. S. B.)—H & W 2, 4, 5sp.; Sipp 1 & 2 sp.; Allen 2 & 6-sp.; Avey, Demco, Lel-Gif. 1-sp.; Avey 2-sp.

DRILLS (MISC.)—Baker No. 217 (2) Hvy. Duty; Hamilton 42" S. H.; Barnes 20" & 24" 1-sp. & 20" 4-sp.; P W No. 12 Multi-Sp.; Natco 20 sp. Rect. head; P. & W. 24 sp. rectangular head Adj.

GEAR CUTTERS—B & S 26" s. p. d. automatic spur; Cincinnati 36" gear cutter. G. & E. 48" gear Cutter.

GRINDERS—P & W 12" vert. surf.; Cin. No. 1½ & B & S No. 12 univ. tool, B & S Nos. 11&16 pl. ; B & S No. 2 and Abrasive No. 33 Surf. Heald Nos. 60 & 65 Int.; Landis 10x30" Plain; B & S 10x48"; Badger No. 220, auto. d. e., opposed disc (4); Norton 10" x 35"; Diamond No. 2 Auto. Surf.; Ott 5"x18"; Landis No. 3 Univ.

HAMMERS—Mayer 50-lb.; W & W 165 lb.; Kane & Roach 70 lb.; Beaudry 150 lb.

KEYSEATERS—Mitts & Merrill No. 5 vert. Davis No. 1; M. & M. No.0; M. & M. No. 2.

LATHES—Monarch 16"x10' M.D.; Lehmann 18"x8'; Amer. 22x8'; Davis 22"x10'; L & S 20"x10'; S-B & E 20"x10' q. c. g; Flather 22"x10'; LeBlond 16"x8'; Gleason 45"x12'; Monarch 16"x8' (2); Ryerson 20x10', m.d.; S.B.E. 30"x12' Q.C.G. Hendey 16"x8' C.H.; Hendey 16"x10' grd. hd.; Sidney 18"x8' and Flather 16"x8'. L. & S. 16"x8' M.D.

MILLING MACHINES—Ohio No. 29, Ohio No. 20, Cin. No. 3, Hendey No. 3, B & S No. 3, LeBlond No. 3H, Cinc. No. 1 s.p.d. Plain; LeBlond No. 4 M.D. C.D. & Cleveland; No. 2, s.p.d., Plain Cinc. 24' Auto. Plain; Model "B" Vertical; Owen Duplex; Ingersoll M.D. Slab Miller 4 hds.; Newton Vert. with rotary table; Becker No. 2 Vert.

THREAD MILLERS—Smalley General No. 23-A; Moline No. 10

PLANERS—Gray 28"x28"x6' 1-hd.; Pond 32"x34"x10'; Sellers 36x36x12'; Pease 26"x26"x9'; Pond 54"x54"x12' 4 hds.

PIPE MACH.—Williams 6" cap.

PUNCH PRESSES — Ferracute No. P-4; Barouth No. 3 & No. 4 O.B.I.; Bliss No. 62; Toledo No. 5; Toledo No. 31 & No. 32; Fer. No. EGF 52 Coining; Willard No. 4A o.b.i.; Swaine No. 38 arch; Cons. No. 24 Blanking.

SAWS (HACK)—Peerless 6x6" H.S. (4); Atkins 8x8"; Racine 6x6"

SAWS (COLD)—Cochrane & Bly Nos. 2-B & 4-B; Higley No. 14

SHAPERS—S & M, G & E, Ohio, Mi., Q. City, Davis, Cin. 16"; Ohio & G & E 20"; S & M, Q. City, Rock, Cin. 24"; Ohio 26"; Cin. 24" s. p. gr. box; American 24" heavy, b.g. Amer. 15"; Springf. 15"; S.&M. 26", b.g. G. & E. 24", s.p., gearbox; Amer. 20"; Rockf. 24" gearbox.

SCREW MACHINES—8 Hand; B.&S. No. 4 Hand; Gridley 4-sp. ¾"; W & S No. 2

SQUARE SHEAR—D & K 10' 3/16" cap.

SLOTTER—Barr 12"

TAPPING MACHINES—(2) Garvin No. 2 & 2X Vertical Automatic & Garvin No. 1.

TURRET LATHES—Baush 30" M.D.; Potter & Johnston, 8½x16 No. 10; Libby 24", m.d.; Gisholt 24" swing 6¼" hole; P. & W. 2¼" hole grd. hd.; Greenlee 2¼x26

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100" N.B.P. Hvy. M.D.
84" Betts, Heavy 77" swing
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51" Bullard, P.R.T.

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3½' Bickford, Gear Box, S.P.D.
3' Cinci. Bickford S.P.D.
3' N.B.P. Univ. M.D.
5' Western S.P.D.
4' Fosdick, Pl. Gear Box
4' Dreses Plain
4' Western S.P.D.
No. 13 P. & W. Multi
No. 13 Natco Multi.
36" Cinci. Bickf. Uprights, MD.
28" Cinci. Upright T.A., M.D.
22½" Barnes Upright
Baker Type M, Tapping
2 spin. Hoefer, 21"
Bausch No. 30 Multi spin. 30" round head 8 spin.

GRINDERS

6' Reed Prentice Vert. Surface 78" feed, chucks.
15"x15"x96" Norton Open-side Surface, M.D.
16"x68" Landis Crankshaft
No. 6 Bryant Chucking
No. 6 Landis Cyl. Grinder
No. 3 Landis Universal
No. 2 Sellers Univ. Tool
18" Besly No. 26 Disc
20"x96" Landis Cyl. M. D.
20"x96" Landis Univ.
20"x216" Landis Cyl. M.D.
24"x 96" Landis Cyl. M. D.
30" x 240" Landis Roll M. D.
No. 11 Landis Tool & Cutter
No. 52 Greenfield "Hydroll" Int.
No. 55, 60 and 65 Heald Cyl.
90" Bridgeport Shear Knife

LATHES

9"x20" Porter-Cable
12"x6' Davis, M.D.
14"x6' Monarch Q.C.G., Cone
16"x6' Sidney, Q.C.G.
16"x8' South Bend, L.C.G.
17"x6' LeBlond, 3 cone
18"x8' Whitcomb Bl. Grd. Hd.
18"x12' Amer. 3 cone, Dbl. Grd.
19"x12' LeBlond Grd. Hd.
20"x14' Monarch, Q.C.G.
22"x12' Amer. 4 cone

LATHES (Continued)

22"/24"x12' L. & S., Q.C.G., M.D.
24"x10' Pittsbgh., Q.C.G., Cone
24"x10' Amer. Grd. Hd.
24"x12' Putnam Grd. Hd., M.D.
24"x12' Reed Prentice Grd. Hd., T.A., Q.C.G.
24"x15' N.B.P. Q.C.G., T.A.
24"/32"x24' LeBlond Q. C. G. Cone, raised in sand
26"x11' Wickes Heavy Cone
30"x12' L. & S., Cone, Q.C.G.
30"x16' N.B.P. Axel & Journal, Center Drive, M.D.
32"x18' Fifield, triple grd.
33"/47"x16' Putnam, Cone
36"x14' Rahn Larmon, Q.C.G., Cone
36"x25' Pond, 2 carr., Tri. Grd.
36"x27' Gleason. F. Plate Dr.
42" N.B.P. Center Dr. Whl.
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48"x16' Fifield Cone
48"x20' Bement Miles Cone
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No. 3 Nevt. Miller, 30"x30"x6'
No. 3 Ingersoll Knee Type Vert. & Horizontal Spindle
No. 4B Becker Vert.
No. 6 Becker Vert. M. D.
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No. 6 Jackson Die Sinkers (3)
No. 1 Standard Hand

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60"x60"x14' Niles 4 hds.
42"x42"x16' N.B.P., M.D.
48"x48"x16' Belmer-Eames, 4 hds., self cont., M.D.
36" Newton Rotary, M.D.
36"x36"x12' Ryerson Opens.
36"x36"x12' Chandler, 3 hds.
30"x30"x10' D. & H. Openside
24"x24"x12' American
22"x22"x6' American
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TURRET LATHES

2½"x26" P. & W. Grd. Hd.
No. 3 Bardons & Oliver Fox Lathe
No. 4 Bardons & Oliver Fox
No. 5 Foster, 1-13/16" capacity
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24" Gisholt, 6¼" H.S., 2 cone
24" Steinle M.D. 6¼", h.s., (4)
28" Steinle M.D. 8¼", h.s.
2¼"x24" & 3"x36" j. & L.
3"x36" P. & W. Bar

MISCELLANEOUS

Automatics, ⅝" Clevel. Model A
Automatic, 2¼" Gridley, 1 Sp.
Automatics, 2-3" - 3-3" Clevel. Model A Sgl. Sp. (2)
Automatics, No. 5A Potter & Johnsons Chuckers (2)
Billet Breaking Mach., Ajax
Bolt Threader, 2" Landis
Bolt Threader, 2" Natl.
Chucking, No. 34 New Brit.
Die Sinkers, No. 6 Jackson (3)
Gear Cutters No. 3 & 4 Adams Gear Hobbers
Gear Cutter, 110" Newton Spur
Header, 1¼" Acme Rivet
Header, 2" Acme Steel
Jarring Mach., Herman Jolt Mould
Keystrs., Nos. 1 & 3 Bakers
Keystrs., Nos. 4 & 6 M & M, M.D.
Lapper, Norton Type 1C
Oil Groover, No. 1 Garvin
Pipe Machine, 4" Saunders No. 4B
Pipe Mach. 8" & 12" Williams
Pipe Machine, 12" Saunders
Pipe Mach., 12" Curtis & C.
Pipe Machs. 3" Stover M.D.
Pipe Mach., 2" Bignall Keeler
Press, No. 3A Bliss, Dble. Ck.
Press, No. 61 Spec. V. & O.
Presses, No. 18 Bliss B. & Fl.
Press, 400 ton N.B.P., 96" Horiz., Hyd., Loco. wheels
Press, No. 58 Perkins S.S. Grd.
Press, No. 9 Perkins S.S. Grd.
Press, No. 44 Advance Cam
Punch 54" H & J No. 2 D.E.
Rolls, Angle Bending, 4"x4"x¼" Williams & White No. 2
Rolls, 6'x¼" H. & J. No. 2
Rolls, 12' Corrugating—Heavy
Saw, 6" Avey Milband
Saw, 6" Gorton No. 2B Inter.
Saw, 24" Nutter Barnes Cold
Saw, No. 15 Lea Simplex Cold
Shaper, 14" Steptoe
Shaper, 16" Kelly
Shaper, 36" Morton, railroad
Shaper, 32" Morton Draw Cut
Shaper, 28" Ohio Dreadnaught M.D.
Slotter, 14" Newton
Slotter, 15" Putn., D.C., M.D.
Slotter, 18" Newton, Hyy. D.
Slotter, 24" Dill A.C., M.D.
Swager, No. 6 Langelier, M.D.

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GRINDER, 12"x36" Pratt & Whitney, belt dr.
GRINDER, 12"x36" Modern Plain Cylindrical, self ctd. drive
LATHE, 54"x16' Johnson, motor drive
LATHE, 30"x20' LeBlond, motorized, q.c.
LATHE, 20"x12' LeBlond, belt drive, q.c.
LATHE, 18"x16' Flather, belt drive, q.c.
TURRET, No. 1 W & S, belt drive, ⅝" capacity, collets
KEYSEATERS, No. 5 Mitts & Merrill
MILLER, 18" Cinc. Pl., b.d., tbl. 8"x29"
NIBBLER, No. 2 Campbell, 12" thr., ⅜"cap.
PLANER, 48"x60"x14' D.&H. Opens., b. d.
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Lathe, 28"x20'. 6" Rahn Carpenter, with rais. blocks.
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Milling Machine, 20"x20"x8' Ingersoll Slab, m. d.
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Shaper, 24" G. & E. back geared crank.
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Turret Lathe, 2¼" J. & L., cross slide head.
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No. 52 National Acme (2)

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4-spindle Woodward & Roq.
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10" Excelsior
20" Barnes
20" Superior
½" Commander Electric
½" Utility, Electric
20" Silver
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14" Barnes
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3' Carlton Radial (2) sensitive
3' American Radial (2) sens.
Weigle Vertical 1 spindle (3)
No. 2 Foote-Burt Rail 6-spdl.
Bausch Multiple, 8-spindle

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No. 2 Brown & Sharpe Surf.
10"x36" Norton Plain Cyl.
Thompson Universal
No. 60 Heald Internal
Wilmarth & Morman Surface

LATHES
58"x22' Fitchburg
12"x4 American 47AP Bench
14" Hamilton LCG
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12"x5' Sheldon (new)
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17"x6' Sidney MD.
18"x8' Walcott
5"x5' Fitchburg LoSwing (4)
20"x10' Lodge & Shipley
No. 6 LeBlond Multi. Cut (4)
16"x6' Rockford Plain (2)
16"x8' Hendey
Boye & Emmes
Reid

MILLING MACHINES
No. 2 Kempsmith Universal
No. 1 Kempsmith Universal
No. 4B Becker Vertical
Oesterlein Plain (2)
Ingersoll Slab

SHAPERS
8" Shape Rite (new)
20" Davis
20" Gould & Eberhardt
20" Stockbridge

PLANERS
Ohio 24x24x6
4" Wallace, bench

TURRET LATHES
No. 6 B. & S. (2)
21" Gisholt (2)
24" Gisholt
No. 4½ Bardons & Oliver
No. 3 Foster

MISCELLANEOUS
Garvin Cam Cutters
8" Gleason Bevel Gear Generators (2)
24"x8" G&E Gear & Bevel Cut.
No. 3 LaPointe Broach (2)
Combination Woodworking Machine
Vertical Heads
No. 101 Niagara Punch Press
No. PG5 Ferracute Press
Famco Presses (new)
Rousselle's (new)
No. 63 Consolidated
No. 2 Atkins Hack Saw
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Avey 4 spindle, drill, No. 2 m. t.
Avey 6 spindle, drill, No. 2 m. t.
No. 1B & No. 2B Edlund two spindle, B.B. drills
16"x48" Landis Crankshaft grinders
20" Kelly Shaper, B.G. Cone
10' Robinson Toggle press brake
3 Spindle Kern. B.B., drill with tapping heads
24"x24"x6' Cincinnati planer, 1 head.
20"x10' Monarch lathe, q.c.g., cone
18"x8' Chard Lathe s.q.c.g., cone
No. 2X Garvin Tapping Machines

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No. 5-A Potter & Johnston Auto.
No. 1-B Foster Universal.
3"x36" Jones & Lamson
10" 2-spindle, Jones & Lamson, Steel Head

MILLERS

No. 2B, Hendey Plain, S.P.D.
No. 2 Cincinnati Hi-Power plain
No. 2 Brown & Sharpe Vertical
2" Pratt & Whitney Spline.

SHAPERS—PLANERS

24" Stockbridge shaper
30" Morton Draw Cut Shaper

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51" Bullard Vertical
2—72" Bickford Verticals
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No. 1 Garvin, 2 Spdle. Profiler
No. 11 Pratt & Whitney Multiple Drill
No. B—16 Natco, Multiple, 24 Spdles.
4 Spindle Leland-Gifford Drill
500# Bradley Hammer
8" Standard Pipe Machine, MD.
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No. 6—72" Brown & Sharpe Gear Cutter
No. 4—48" Brown & Sharpe Gear Cutter
Nos. 1 1B, 2 Campbell Nibblers
No. 21-SA Cochrane Bly Hi-Speed Saw
No. 178 Toledo Toggle Press

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Miller 1A K & T Plain M.D.
Miller 2B K & T Plain S.P.D.
Miller No. 3 K & T Vertical Motor in base
Miller No. 2 Cleveland Univ. M.D.
Miller 6x48 Pratt & Whitney Thread
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Shears 3 ft. 4 ft. 5 ft. Niagara
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Shapers 16" Whipp B. G. M.D.
Shapers 24" Steptoe S.P.D.
Shapers 28" American S.P.D.
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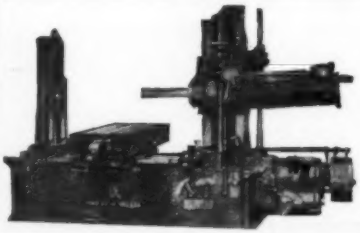

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15x8 South Bend
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No. 2C Double Crank-Tie Rod Frame Bliss 42"
No. 18-19-58 Bliss
No. 4 Z & H
No. 0 & 1½ V & O
No. 0 Consolidated
No. 23 Adriance Horning
No. 103 V & O—Geared 6" Stroke
No. P3 Ferracute Back Wheel
No. 1 & 2 Bliss Back Wheel

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1" Milholland
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1½" Acme Power Feed To Turret
1½" Biggs
2x24 Jones & Lamson
3¼x36 Acme Flat Turret G. H., M.D.
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(2) ½" Cleveland Automatics

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50" Bickford 2 Head Gear Box Drive
30" Flather
5" Needham Floor Type Horizontal

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No. 1½ Cincinnati Plain
No. 4 Cincinnati Universal
No. 2 Cincinnati Universal
No. 1 Steptoe Plain
Taylor & Fenn Vertical Motor Driven

MISCELLANEOUS

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5' Niles Bement Pond Radial G. B. Dr.
No. 3 B & S—Gear Cutter
G & E Gear Cutter
Natco Multiple Sp. Drill
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16x7 Sidney, Q.C.G.
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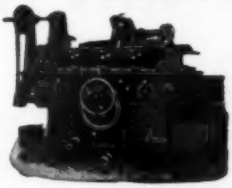

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1—No. 6 Diamond
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1—No. 6 Besly D. E.
1—No. 50 Gardner S. E.
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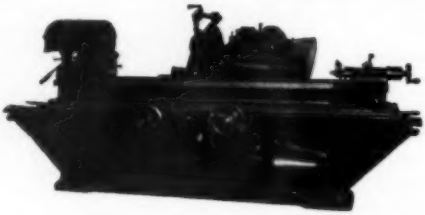

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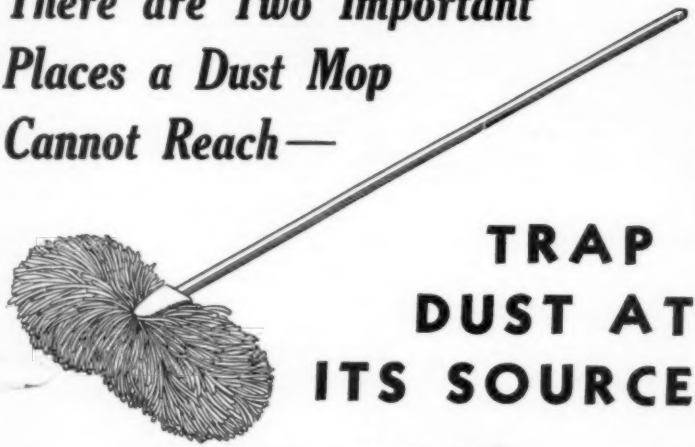
There are Two Important Places a Dust Mop Cannot Reach—



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DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

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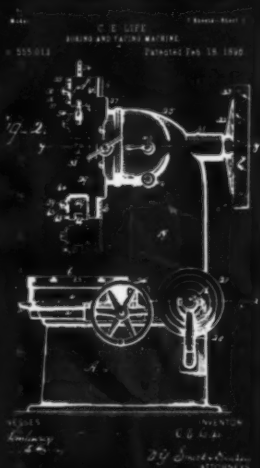
Back in 1896



The Forerunner of the Modern VERTICAL BORING and FACING Machine

Almost a half-century ago, the mechanical skill and inventive resource of the Lipe organization was making itself felt. In February, 1896, a patent granted to C. E. Lipe foreshadowed modern boring and facing machine design—design that eliminated the old top-heavy construction and practically removed tool-chatter and out-of-true. Its two major features were:

1. the work was secured upon a horizontal rotating table.

2. the tool was mounted in a reciprocating holder, fed both laterally and vertically.

A Development of

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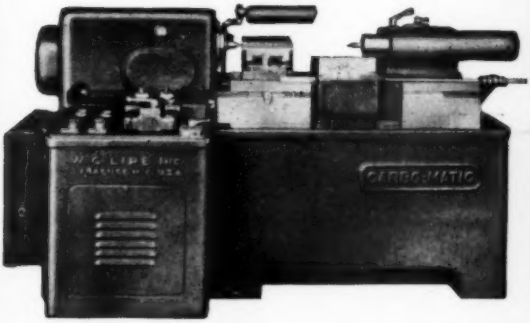

IT'S a far cry from the simple machine work of 1896 to the complex production problems of 1941, but Lipe engineering still keeps a jump ahead of the primary need. And today's Lipe Carbo-Matic lathe provides the high spindle speeds, the brute power and the combined strength and rigidity necessary for efficient operation with modern carbide tools.

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